

Master of Public Health Field Experience Report

BIOSECURITY AND ZOO NOTIC DISEASE RISK AT LIVESTOCK EXHIBITION EVENTS

by

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submitted in partial fulfillment of the requirements for the degree

MASTER OF PUBLIC HEALTH

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Abstract

One of the missions of the Kansas Department of Agriculture Division of Animal Health is to ensure the public health, safety, and welfare of Kansas' citizens through prevention, control, and eradication of infectious and contagious diseases and conditions affecting the health of livestock and domestic animals in the state of Kansas. This mission directly applies to animal exhibition events in Kansas. These types of events pose health risks to both humans and animals that attend the event. Exhibition animals are at an increased risk of contracting an infectious disease due to the commingling of animals from multiple geographical locations. Exhibitors can reduce this risk by taking biosecurity measures with their exhibition animals before, during, and after exhibition events. People visiting these events are at an increased risk of contracting zoonotic diseases due to their contact with animals and their environments. The main objectives of this field experience were to describe the extent of the zoonotic disease risk at the Kansas State Fair through an observational study, and to understand the biosecurity knowledge and practices of youth animal exhibitors in Kansas by conducting a survey of Kansas 4-H animal exhibitors. The results of the observational study at the Kansas State Fair demonstrate the significant amount of zoonotic disease risk present on the fairgrounds. These results were used to provide the Kansas State Fair administration with zoonotic disease risk mitigation strategies for the event. The results from the Kansas 4-H biosecurity survey exposed gaps in the biosecurity knowledge and practices of youth exhibitors. This information was used to provide recommendations to the Kansas State Research and Extension 4-H office for future education and outreach efforts with their youth exhibitors.

Subject Keywords: Animal contact; Biosecurity; Hand hygiene; Livestock exhibitions; Risk behavior; Zoonoses

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Chapter 1

Field Experience Scope of Work

This field experience was completed through a yearlong internship at the Kansas Department of Agriculture Division of Animal Health (KDAH). The division is currently led by Dr. William Brown, the Animal Health Commissioner. The mission of KDAH is “to ensure the public health, safety and welfare of Kansas' citizens through prevention, control and eradication of infectious and contagious diseases and conditions affecting the health of livestock and domestic animals in the State of Kansas; to regulate facilities that produce, sell or harbor companion animals and enforce the laws governing such facilities; to direct an effective brand registration and inspection program to identify ownership of lost or stolen livestock; and to inform the public of the status of livestock health in the state to promote understanding and gain public assistance in achieving this mission” (KDAH 2016). There are currently three programs that make up KDAH; they include Brands, Animal Disease Control, and Animal Facilities Inspections. These three programs are dedicated to protecting the health, welfare, and integrity of the livestock and small animal industries in the state.

The original purpose of this internship was to design and conduct an observational study at the Kansas State Fair (the Fair) to describe the extent of the zoonotic disease risk to visitors at the event. This need for this study was discovered during the development of a biosecurity plan for the Fair, designed by a previous intern in 2015. While designing the biosecurity plan, it was realized that the actual zoonotic disease risk at the Fair was largely unknown. This internship was created the following year to fill this need. The data collected during the study would be used to provide the Fair with a zoonotic disease risk mitigation plan tailored to their facilities. This internship encompassed other projects as well; the most significant one being a survey of Kansas 4-H animal exhibitors to gather data on their biosecurity practices surrounding exhibition events. This data was used to provide KDAH information about the current state of exhibitor biosecurity at large exhibition events, as well as provide Kansas State Research and Extension (KSRE) with information for future education and outreach with their youth exhibitors.

Chapter 2

Learning Objectives

1. Learn to apply the knowledge and experience gained from the Doctor of Veterinary Medicine and Master of Public Health programs to contribute as a successful member of the animal health workforce
2. Strengthen understanding of the inner workings of the state animal health department to prepare for a career in public veterinary practice
3. Expand knowledge and experience of livestock disease control and animal disease traceability at the state level
4. Gain hands-on experience with biosecurity and zoonotic disease risk at the Kansas State Fair and other animal exhibition events
5. Effectively demonstrate the value of the professional development gained at the Kansas Department of Agriculture Division of Animal Health through the anticipated field experience products and final report for the Master of Public Health degree

Activities Performed

1. Designed and implemented a study at the 2016 Kansas State Fair to assess zoonotic disease risk through a facility assessment and an observational study of hand hygiene and other high-risk behaviors
2. Prepared a report for the Kansas State Fair administration with the results from the study as well as a zoonotic disease risk mitigation plan for the fairgrounds
3. Designed and implemented an online survey for Kansas 4-H animal exhibitors about their biosecurity practices surrounding exhibition events
4. Prepared a report for the Kansas State Research and Extension 4-H office with the results from the online survey and recommendations for future education and outreach efforts with 4-H animal exhibitors
5. Assisted the Deputy Animal Health Commissioner in designing a biosecurity plan for the American Royal, a national livestock exhibition event

6. Attended a cattle producer outreach meeting focused on “Continuity of Business” in Great Bend, Kansas in August 2016
7. Attended the United States Animal Health Association annual meeting in Greensboro, North Carolina in October 2016
8. Participated in the four-day, functional, animal health emergency exercise, Afterburn, as the Biosecurity and Disease Prevention Supervisor in December 2016
9. Developed and implemented an online survey for Afterburn participants to collect information for the after action report for the exercise
10. Attended the Secure Beef Supply steering committee meeting in Kansas City, Missouri in January 2017
11. Assisted field veterinarians on multiple occasions with tuberculosis testing in cattle, avian influenza and Pullorum testing in poultry, and checking-in cattle at the Kansas Junior Dairy Show

Products Created

1. Seven species-specific biosecurity factsheets – These were created for exhibition events and published on the Division of Animal Health’s website. They focus on the biosecurity practices exhibitors can take with their animals before, during, and after an exhibition event. The species included in this project were cattle, goats, horses, pigs, poultry, rabbits, and sheep. Tailored versions of these factsheets were provided to the Kansas State Fair to distribute to their exhibitors as they see fit. The original versions can be found in Appendix 1.
2. Kansas 4-H biosecurity survey report – This report was created for the Kansas State Research and Extension 4-H office. This report includes the survey results as well as recommendations for future outreach and education efforts for youth exhibitors. This report can be found in Chapter 3.
3. Kansas State Fair observational study report – This report was created for the Kansas State Fair administration. This report includes the results from the study as well as recommendations for zoonotic disease risk mitigations strategies on the fairgrounds. This report can be found in Chapter 4.

Chapter 3

Youth Biosecurity Survey

In the wake of recent animal disease outbreaks in the United States (U.S.), biosecurity has become an increasingly important aspect of the livestock industries. Although biosecurity is a necessary tool that producers should use to prevent the introduction of disease into their herds and flocks, it is not always practiced on a daily basis at livestock operations. Recent disease outbreaks in the swine and poultry industries have proven that to be true.

In April 2013, the U.S. swine industry was hit with an epidemic of porcine epidemic diarrhea virus (PEDV). Since the initial case of PEDV in the U.S., 39 states have reported at least one confirmed case of the disease (AASV 2016). This disease typically has a 100% morbidity rate in swine herds, with up to 100% mortality in young pigs (AASV 2013). Epidemiological investigations into these outbreaks determined that poor adherence to biosecurity principles and practices were the culprit in introducing this virus into naïve herds (AASV 2013). These biosecurity practices included things such as showering into and out of swine facilities, cleaning boots, trucks, and equipment before moving between farms, cleaning trucks used for transportation between loads of animals, and quarantining new market-bought hogs from the resident herd. Failure to comply with these preventative measures led to the spread of PEDV between swine farms across the nation.

In December 2014, highly pathogenic avian influenza (HPAI) was discovered in a wild bird in the state of Washington (USDA APHIS 2014). By the end of 2015, 223 confirmed cases of HPAI were found across the country in commercial and backyard flocks, as well as in wild birds. More than 48 million turkeys and chickens were depopulated as a result of this catastrophic outbreak (USDA APHIS 2015). Epidemiologic investigation identified the cause of the perpetuation of the outbreak through poultry flocks as poor compliance with biosecurity measures among poultry farms (USDA APHIS VS 2015). These biosecurity measures included things such as employees having dedicated coveralls for the poultry barns, having a vehicle wash station on the farm, preventing wild birds from gaining access into the poultry barns, not sharing equipment between farms, and not having personnel travel back and forth between poultry farms.

Lack of adherence to strict biosecurity measures perpetuated the spread of HPAI among commercial poultry flocks, leading to devastating consequences.

These outbreaks are unfortunate, but exemplify the devastation that poor biosecurity practices can cause in the face of a novel disease to naïve herds and flocks. These types of outbreaks are easily capable of happening at exhibition events if exhibitors do not take proper biosecurity precautions with their exhibition animals. Animals at exhibition events are at a high risk of being exposed to an infectious disease due to the commingling of animals from many geographical locations. An outbreak of an infectious disease at an exhibition event could be perpetuated as the animals return home or relocate to new geographical locations. It is not just novel diseases that can cause devastating outbreaks, however. Currently causing distress at exhibition events in the U.S. is Equine Herpesvirus Myeloencephalopathy (EHM), a neurologic disease caused by certain strains of Equine Herpesvirus-1 (EHV-1). There is no treatment for this disease apart from supportive care; many affected horses die or are humanely euthanized due to their severe neurological disease. There were at least 24 confirmed cases of EHM reported in 2016. At least seven of those cases occurred at an exhibition event or racetrack (EDCC 2017). Locations with confirmed cases of EHM had to undergo quarantine. This required keeping the horses that were present when the first case was diagnosed at the facility for 21 days after the last clinical sign is seen – much longer than these exhibitors ever planned to keep their horses at the event (NCSU CVM 2017).

Several articles have been published looking at disease modeling and the risk factors involved with animal disease outbreaks and dissemination from locations with commingling of animals. A study conducted with data collected at the California State Fair in 2005 looked at the impact a Foot and Mouth Disease (FMD) outbreak at the fair would have on the state's livestock industry. It was determined that due to the large number of animals commingling on the fairgrounds and then disseminating again, along with the high likelihood that animals would not be showing clinical signs of disease before dispersing, that the FMD virus would be widely disseminated throughout California and into other states before the first case was diagnosed (Carpenter et al. 2007). Similarly, 1 study in Australia looked at the potential risk of the introduction of avian influenza into domestic poultry flocks through wild bird contact with

exhibition poultry. They determined that due to the biosecurity practices of poultry exhibitors, direct and indirect contact with wild birds likely occurs, thus putting the domestic poultry at risk for contracting avian influenza. The return of exhibition poultry to their home flock then in turn puts more birds at risk for exposure to avian influenza (Hernandez-Jover et al. 2015). Moving away from the hypothetical, epidemiological studies published from the FMD outbreak in the United Kingdom in 2001 identified that sheep moving through livestock markets as the culprit for disseminating FMD virus throughout the country. Sheep do not exhibit obvious clinical signs of disease when shedding FMD virus, so they can easily be moved without any indication of being infected. These infected sheep were being moved through livestock markets by sheep dealers seven days before the first cases was diagnosed at a slaughterhouse (Mansley et al. 2003). These three examples show the widespread disease spread that is possible after subclinical animals are commingled at a common location and then disseminated again.

Proper biosecurity at exhibition events can help prevent the spread of disease among the animals. As youths makes up the majority of exhibitors at livestock exhibition events, they are a good population to educate and train about biosecurity practices and principles. It is hoped that if exhibitors are taught sound biosecurity principles and practices at a young age, they will be more likely to continue those practices throughout their lives with their livestock and horses. This foundational knowledge will also be beneficial to them as the Secure Supply plans and other similar biosecurity plans continue to build influence and momentum the livestock industries. Practicing biosecurity at exhibition events is also important as there are typically no vaccination or specific management requirements to exhibit animals at these events. Some events require a Certificate of Veterinary Inspection, but these are generally valid for 30 days, and may not accurately reflect the health of the animal on the day they are brought to the event.

KDAH wanted to understand what knowledge youth exhibitors in Kansas already have about biosecurity and what biosecurity practices they use with their own exhibition animals. This information would be provided to KSRE to tailor future education and outreach efforts for their youth exhibitors. KDAH partnered with KSRE to survey the currently enrolled Kansas 4-H animal exhibitors. 4-H is a youth program delivered by public universities across the country that “provides experiences where young people learn by doing” (National 4-H Council 2017). It is

designed for kids to take-on “hands-on projects in areas like health, science, agriculture and citizenship, in a positive environment where they receive guidance from adult mentors and are encouraged to take on proactive leadership roles” (National 4-H Council 2017). One of the popular projects is raising livestock and other animals to show at exhibition events such as county fairs and the Kansas State Fair. The design of the survey was based off an in-person survey conducted at the California State Fair in 2005 (Thunes and Carpenter 2007). Due to the limited ability to conduct a survey on the Kansas State Fairgrounds, an online survey was implemented instead. This allowed the ability to widen the scope of the survey from only the Kansas State Fair (KSF) to multiple livestock exhibitions in Kansas.

Details of this project, including the survey design, results, and recommendations, are summarized in the report below. This report was originally prepared for KSRE; some changes have been made, however, to ensure understanding by a broader audience. The author was available to answer any questions and address any concerns KSRE had with the information in the report.

2016 Kansas 4-H Biosecurity Survey Report

Introduction

The Kansas Department of Agriculture Division of Animal Health (KDAH), in partnership with Kansas State Research and Extension (KSRE), conducted an online survey of Kansas 4-H animal exhibitors during the fall of 2016. The goal of the survey was to gain an understanding of current biosecurity knowledge and practices of youth animal exhibitors in Kansas. There has been an increased emphasis on the importance of biosecurity in the animal health industry due to animal disease outbreaks across the country in recent years. The information collected from the survey was used to identify areas of biosecurity knowledge and practices needing improvement. KDAH and KSRE plan to focus on these areas for future education and outreach for youth exhibitors.

Methods

The online survey was administered through Formsite. It opened on Tuesday, November 15th, 2016 at 10:00am and closed on Wednesday, November 30th, 2016 at 11:59pm. The survey was sent to approximately 3900 families enrolled in Kansas 4-H animal projects during the 2015 – 2016 year. Each family received an email with the initial invitation to complete the survey, followed by two reminders emails before the date the survey closed. Each family that participated in a Kansas 4-H animal project during the 2016 calendar year was requested to complete the survey once for their household. The main interest of the survey was species that can be affected by economically devastating infectious diseases such as Foot and Mouth Disease (FMD), Avian Influenza (AI), and Equine Herpesvirus-1 (EHV-1). For that reason, data collection was focused on biosecurity in the major livestock species only (beef cattle, dairy cattle, meat goats, dairy goats, sheep, swine, poultry, and horses). Rabbits were not included in the survey as an exhibition species, as they are not considered a major livestock species in Kansas. Therefore, these results do not represent any 4-H families that only showed rabbits during 2016. The survey was anonymous, and no personal information or IP addresses were collected. The survey administrator prevented multiple submissions from the same person.

Exhibitors were initially asked if they showed a 4-H animal at an exhibition event during 2016. This was the only required question. Those that reported they did not show any animals at an exhibition event in 2016 were automatically directed to the end of the survey and were not able to provide responses to any other questions. The exhibitors that did show a 4-H animal at an exhibit were asked to provide answers to the remaining questions. To improve the survey response rate, these questions were not required, and therefore, exhibitors did not have to provide answers to every question. Exhibitors were asked to provide information about which exhibitions they showed at; what species of animals they exhibited; whether those animals were market or breeding individuals; where their exhibition animals went at the end of each exhibition; what biosecurity measures exhibitors practice before, during, and after exhibition events; their relationship with a veterinarian; their horses' vaccination history; and the non-4-H animals they have on their property. Species-specific questions presented to the exhibitors only if they indicated they exhibited that particular species. Exhibition-specific questions presented to the exhibitors in a similar way. Due to the limited nature of the data output from Formsite, the results were only able to be summarized with descriptive statistics. The results from each survey question are presented below.

Results

There was a 24% response rate to the survey, totaling 937 responses. 834 of the responses were complete, meaning the responder moved through all the questions until they reached the success page. Both complete and incomplete responses, however, are included in the results. Of 909 responses, 808 families (88.4%) showed their 4-H animal(s) at an exhibition event during 2016. Table 3.1 shows how many 4-H families showed their animals at each exhibition in 2016.

Table 3.1. Exhibitions that 4-H families showed their animals at in 2016.

Show(s)	Number of Families	Overall Percentage
County fair only	542	67.2%
County fair + KSF + KJLS	119	14.7%
County fair + KSF	90	11.2%
County fair + KJLS	43	5.3%
Kansas State Fair (KSF) only	6	0.7%
A different exhibition	4	0.5%
KSF + KJLS	2	0.2%
Kansas Junior Livestock Show (KJLS) only	1	0.1%

Families who reported they showed at their county fair were asked which species they showed at that event. The distribution of species exhibited at the county fair level is shown in Table 3.2.

Table 3.2. Number of 4-H families that showed each species at county fairs in Kansas in 2016[†].

County Fair Species	Number of Families	Overall Percentage*
Beef cattle	369	47.0%
Swine	315	40.1%
Meat goats	275	35.0%
Horses	164	20.9%
Sheep	158	20.1%
Poultry	125	15.9%
Dairy goats	35	4.4%
Dairy cattle	27	3.4%

[†]785 responses

*Total percentage is greater than 100% because 435 families showed more than one species at their county fair

Families who indicated they showed at the 2016 Kansas State Fair were asked which species they showed at that event. The distribution of species exhibited at the Kansas State Fair is shown in Table 3.3.

Table 3.3. Number of 4-H families that showed each species at the Kansas State Fair in 2016[†].

Kanas State Fair Species	Number of Families	Overall Percentage*
Beef cattle	63	29.4%
Swine	58	27.1%
Sheep	57	26.6%
Horses	45	21.0%
Meat goats	37	17.3%
Poultry	11	5.1%
Dairy goats	5	2.3%
Dairy cattle	4	1.9%

[†]214 responses

*Total percentage is greater than 100% because 58 families showed more than one species at the Kansas State Fair

Families who indicated they showed at the 2016 Kansas Junior Livestock Show were asked which species they showed at that event. The distribution of species exhibited at the Kansas Junior Livestock Show is shown in Table 3.4.

Table 3.4. Number of 4-H families that showed each species at the Kansas Junior Livestock Show in 2016[†].

Kansas Junior Livestock Show Species	Number of Families	Overall Percentage*
Beef cattle	71	43.3%
Sheep	48	29.3%
Meat goats	45	27.4%
Swine	44	26.8%

[†]164 responses

*Total percentage is greater than 100% because 39 families showed more than one species at the Kansas Junior Livestock Show

Table 3.5 shows the number of families at each exhibition in 2016 who showed species that are susceptible to economically important diseases, including FMD, AI, and EHV-1. These numbers demonstrate the impact and extent of the potential spread a disease outbreak could have at one of these exhibitions in Kansas.

Table 3.5. Families that showed susceptible species at each exhibition in 2016.

Species	County Fair	Kansas State Fair	Kansas Junior Livestock Show
FMD susceptible*	713 families	224 families	165 families
AI susceptible**	125	11	Not applicable
EHV-1 susceptible***	164	45	Not applicable

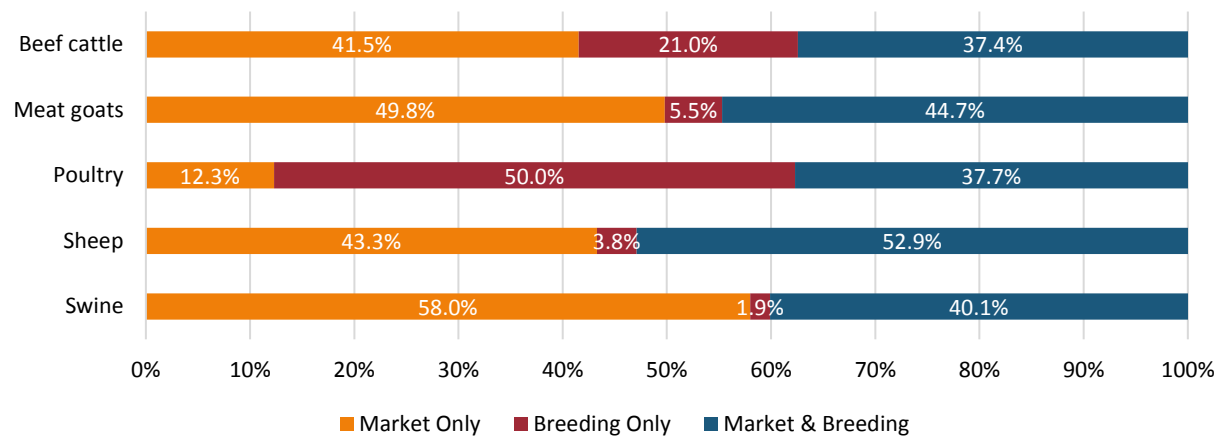
*Cattle, sheep, goats, and swine

**Chickens, turkeys, and ducks

***Horses and donkeys

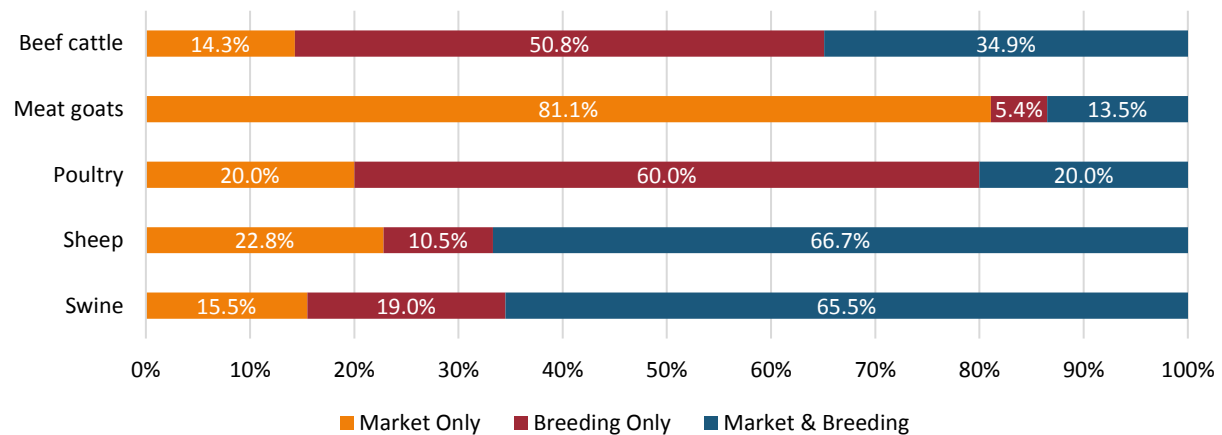
Typically after exhibition events, breeding animals return home with the exhibitor while market animals are sold in the auction at the end of the exhibition. Breeding animals, therefore, have a higher risk of bringing home a disease from the exhibition event to the home herd or flock. This is not always true though as families will often show market animals at their county fair and then later the same year show them again at the KSF or KJLS. Families who indicated they showed at their county fair in 2016 were asked what type of animals – market or breeding – they showed by species. Results are shown in Figure 3.1.

Figure 3.1. Type of animals shown by species at county fairs in Kansas in 2016.



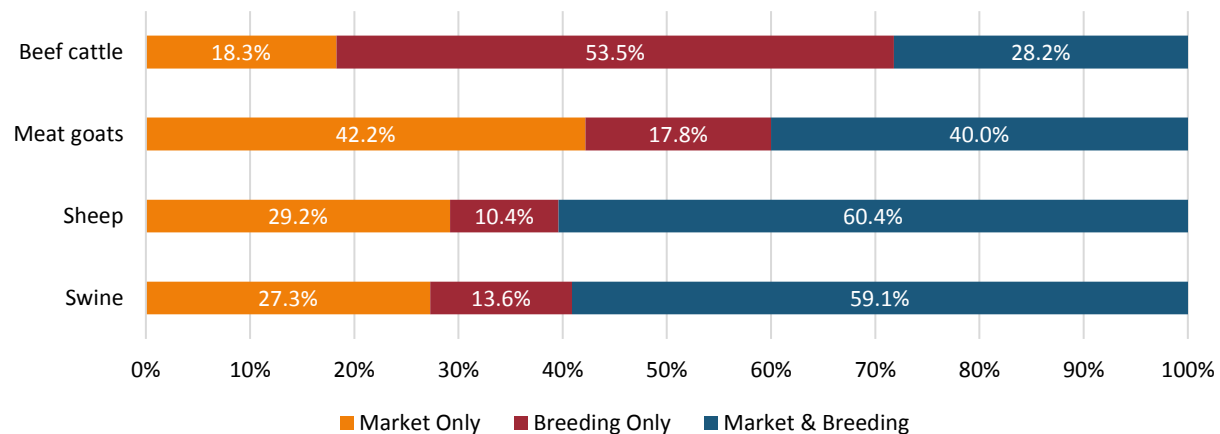
Families who indicated they showed at the 2016 Kansas State Fair were asked what type of animals – market or breeding – they showed by species. Results are shown in Figure 3.2.

Figure 3.2. Type of animals shown by species at the Kansas State Fair in 2016.



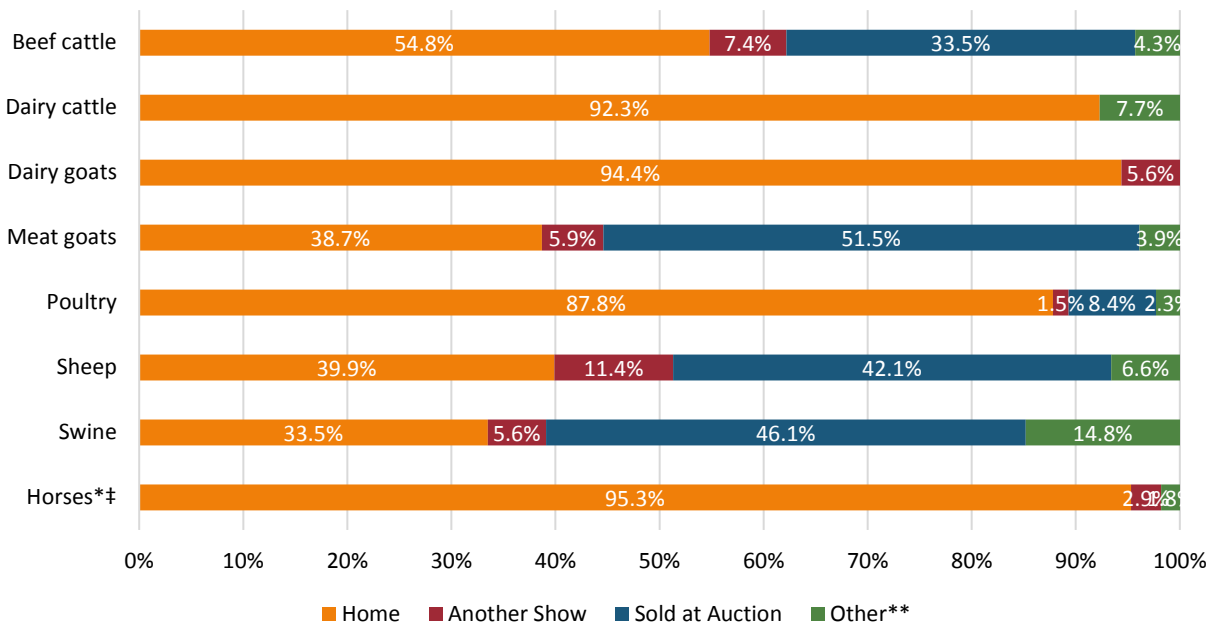
Families who indicated they showed at the 2016 Kansas Junior Livestock Show were asked what type of animals – market or breeding – they showed by species. Results are shown in Figure 3.3.

Figure 3.3. Type of animals shown by species at the Kansas Junior Livestock Show in 2016.



In the event of a disease outbreak at an exhibition event, being able to trace where animals went after they left the exhibition is vital for disease control efforts. Knowing the general destination of the exhibition animals after these events also demonstrates the extent of potential spread a disease outbreak could have at one these events. Families were asked to report where their animals went at the end of their county fair. Options provided included *home*, *another show*, *sold at auction*, and *other*. They were asked to specify the animal's destination if they selected *other*. Results for county fairs are shown in Figure 3.4.

Figure 3.4. The fate of exhibition animals at the end of county fairs in Kansas in 2016[†].



[†]1836 responses

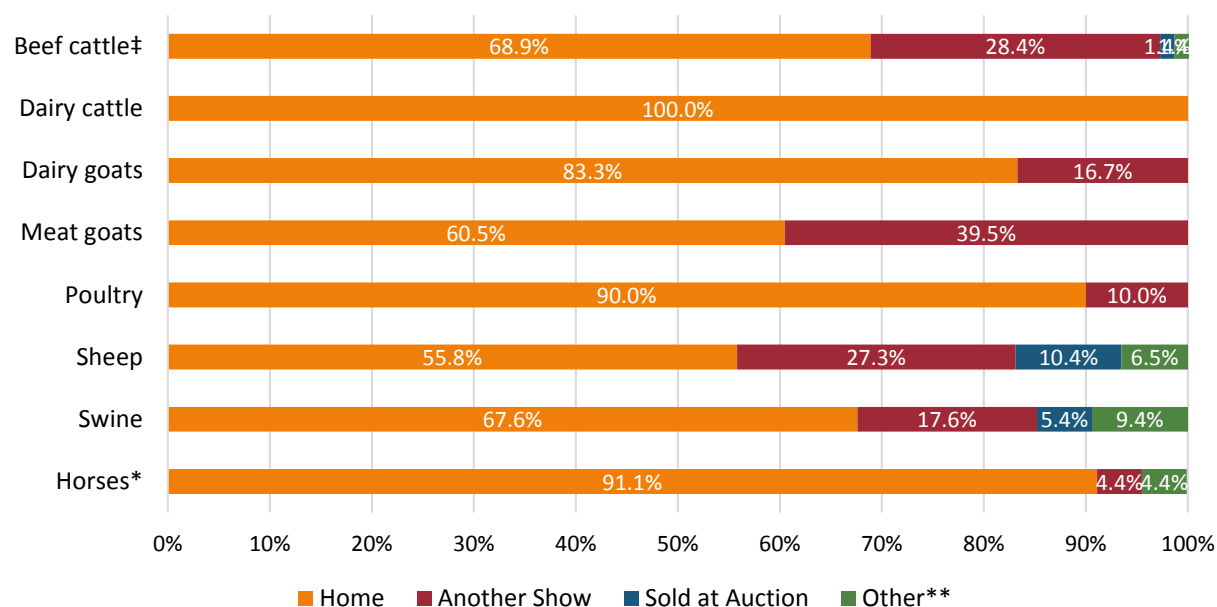
**Sold at auction* was not an option to select for horses

‡Another show: 2.9%; other: 1.8%

**Responses given for *other* included: custom feeding for own consumption; butcher or slaughterhouse; meat locker; private sale; sold back to breeder; and boarding facilities (horses).

Families were asked to report where their animals went at the end of the 2016 Kansas State Fair. Options provided included *home*, *another show*, *sold at auction*, and *other*. They were asked to specify the animal's destination if they selected *other*. Results for the Kansas State Fair are shown in Figure 3.5.

Figure 3.5. The fate of exhibition animals at the end of the Kansas State Fair in 2016[†].



[‡]333 responses

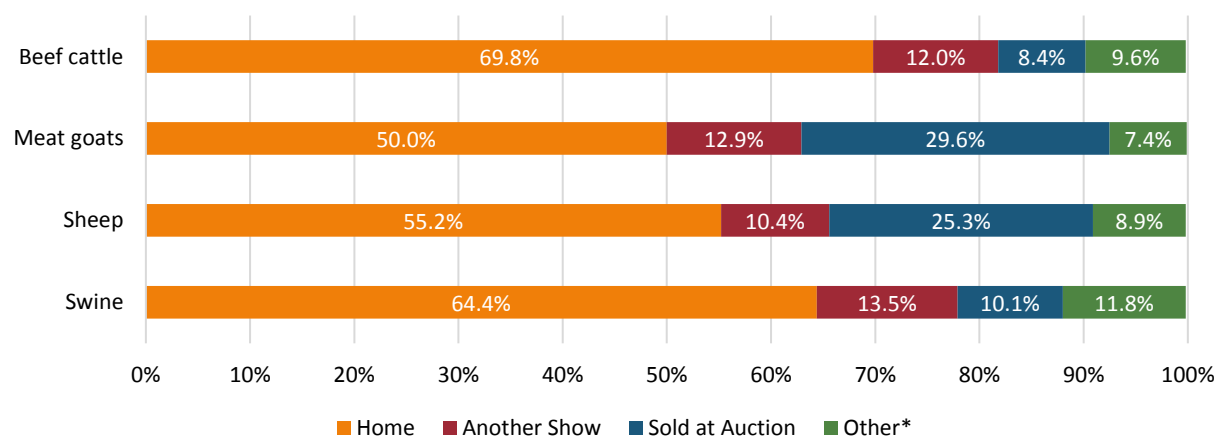
*Sold at auction was not an option to select for horses

**Responses given for *other* included: butcher or slaughterhouse; meat locker; a breeder; and training and boarding facilities (horses).

[‡]Sold at auction: 1.4%; other: 1.4%

Exhibitors were asked to report where their animals went at the end of the 2016 Kansas Junior Livestock Show. Options provided included *home*, *another show*, *sold at auction*, and *other*. They were asked to specify the animal's destination if they selected *other*. Results for the Kansas Junior Livestock Show are shown in Figure 3.6.

Figure 3.6. The fate of exhibition animals at the end of the Kansas Junior Livestock Show in 2016[†].

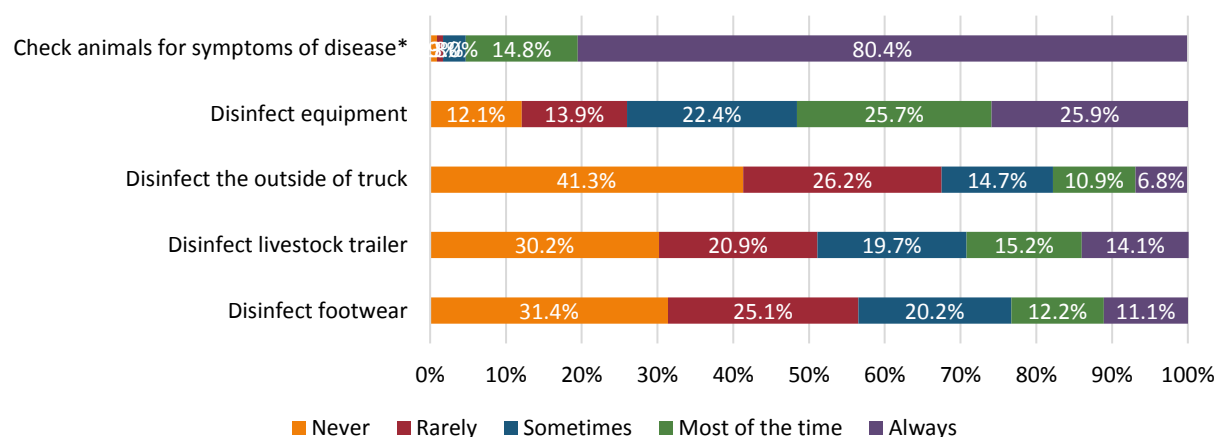


[†]263 responses

**Responses given for *other* included: private sale; butcher or slaughterhouse; and meat locker.

Exhibitors were asked about specific biosecurity measures they take before going to an exhibition event with their animal(s). These are measures that can prevent the spread of disease from an exhibitor's farm to the exhibition location. Results for these questions are shown in Figure 3.7.

Figure 3.7. Biosecurity measures taken by exhibitors before going to an exhibition event[†].



[†]752 – 761 responses per question

*Never: 0.9%; rarely: 0.8%; sometimes: 3.0%

How often exhibitors that reported showing at a county fair in 2016 disinfected their equipment before going to an exhibition event was analyzed by the species exhibited. Results are displayed in Table 3.6. These counts, however, may not be accurate as many exhibitors showed more than one species and, therefore, their responses are counted under each species they reported showing at their county fair. It should also be understood that an exhibitor may disinfect equipment for one species, but not for another.

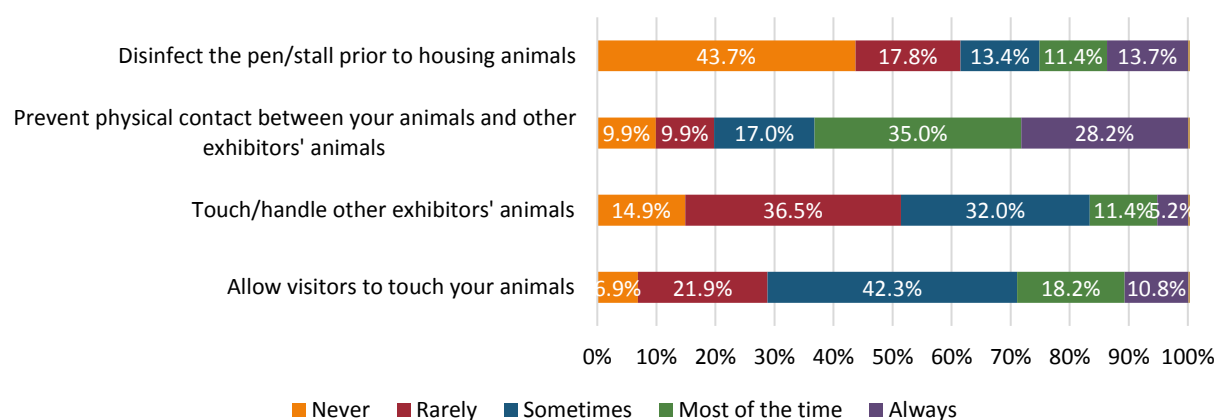
Table 3.6. How often the exhibitors of each species reported disinfecting their equipment before going to an exhibition event with their animals.

	Beef Cattle	Dairy Cattle	Dairy Goats	Meat Goats	Poultry	Sheep	Swine	Horses
Never	13.5%	7.7%	0.0%	7.6%	6.6%	6.7%	12.9%	14.3%
Rarely	14.0	23.1	11.4	10.7	11.5	8.0	14.9	18.0
Sometimes	23.5	15.4	22.9	24.8	27.9	23.3	19.5	24.8
Most of the time	27.2	30.8	31.4	27.9	27.0	30.0	26.2	19.9
Always	21.8	23.1	34.3	29.0	27.0	32.0	26.5	23.0

Out of 752 responses, 108 families (14.1%) said they took other biosecurity measures before an exhibition event that were not listed in the previous questions (Figure 3.7). Of those, 102 provided a description of their practices. Responses included vaccinating and deworming livestock; raising all poultry internally; dusting poultry for parasites; bathing animals; using fly control; Pullorum-typhoid testing poultry to ensure they are test-negative of those two types of *Salmonella*; obtaining a Coggins test for horses to ensure they are test-negative for Equine Infectious Anemia; keeping blankets on sheep and goats to prevent them from contracting ringworm (club lamb fungus); monthly veterinary exams; obtaining a Certificate of Veterinary Inspection (CVI) by having a veterinarian examine the animals and verify they are free of disease; keeping rodents away from feed; and cleaning water troughs regularly.

Exhibitors were asked about specific biosecurity measures they take while at an exhibition event with their animal(s). These are measures that can prevent the spread of disease among animals at the exhibition event. Results for these questions are shown in Figure 3.8.

Figure 3.8. Biosecurity measures taken by exhibitors while at an exhibition event[†].



[†]743 – 747 responses per question

Equipment can act as fomites to spread disease between animals. Sharing equipment at an exhibition event between animals from different farms is an easy way to potentially spread disease among the exhibition animals. For that reason, families were asked if they ever share equipment with other exhibitors at an exhibition event. 330 families (43.9%) reported that they do share equipment, while 421 families (56%) said they do not share equipment. Table 3.7 shows

how often those families who do share equipment disinfect shared equipment before using it with their own animal(s).

Table 3.7. How often families who share equipment disinfect shared equipment before using it with their animal(s).

Never	Rarely	Sometimes	Most of the time	Always
100 (30.5%)	99 (30.2%)	82 (25%)	27 (8.2%)	20 (6.1%)

How often exhibitors that reported showing at a county fair in 2016 disinfected the equipment they shared with other exhibitors before using it when their animals at exhibition event was analyzed by the species exhibited. Results are displayed in Table 3.8. These counts, however, may not be accurate as many exhibitors showed more than one species and, therefore, their responses are counted under each species they reported showing at their county. It should also be understood that an exhibitor may disinfect equipment for one species, but not for another.

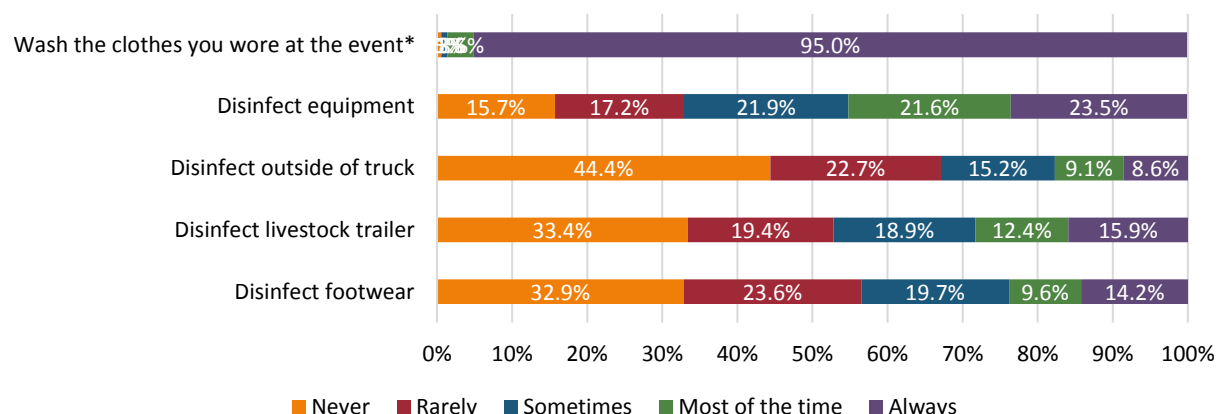
Table 3.8 How often exhibitors of each species that reported disinfecting shared equipment before using it with their own animals at an exhibition event.

	Beef Cattle	Dairy Cattle	Dairy Goats	Meat Goats	Poultry	Sheep	Swine	Horses
Never	34.1%	42.9%	20.0%	29.2%	30.6%	30.2%	30.6%	25.9%
Rarely	30.4	28.6	40.0	35.4	19.4	34.0	26.9	34.5
Sometimes	23.7	14.3	30.0	21.9	36.1	22.6	26.9	22.4
Most of the time	8.9	14.3	0.0	7.3	11.1	5.7	9.3	13.8
Always	3.0	0.0	10.0	6.3	2.8	7.5	6.5	3.4

Out of 745 responses, 66 families (8.7%) said they took other biosecurity measures at an exhibition event that were not listed in the previous questions (Figure 3.8). Of those, 65 provided a description of their practices. Responses included not sharing the common water trough at shows; bringing their own feed; not allowing the public to feed their animals; spraying down pen and equipment with Nolvasan[®] (a chlorohexidine-based disinfectant); keeping equipment off the ground and fences and away from other exhibitors' animals; separating animals stalls with tack stalls or tarps; washing hands frequently, especially after handling other exhibitors' animals; keeping blankets on sheep and goats; only sharing equipment with animals that are housed together at home; using anti-fungal sprays and shampoos; asking visitors to wash hands before handling rabbits; and disinfecting tack and equipment.

Exhibitors were asked about specific biosecurity measures they take after having been at an exhibition event with their animal(s). These are measures that can prevent the spread of disease from the exhibition location to the exhibitor's farm. Results are shown in Figure 3.9.

Figure 3.9. Biosecurity measures taken by exhibitors after an exhibition event[†].



[†]730 – 736 responses per question

*Never: 0.5%; rarely: 0.1%; sometimes: 0.8%; most of the time: 3.5%

How often exhibitors who reported showing at a county fair in 2016 disinfected their equipment after an exhibition event was analyzed by the species exhibited. Results are displayed in Table 3.9. These counts, however, may not be accurate as many exhibitors showed more than one species and, therefore, their responses are counted under each species they reported showing at their county fair. It should also be understood that an exhibitor may disinfect equipment for one species, but not for another.

Table 3.9. How often exhibitors of each species that reported disinfecting their equipment after having been at an exhibition event with their animals.

	Beef Cattle	Dairy Cattle	Meat Goats	Dairy Goats	Poultry	Sheep	Swine	Horses
Never	15.3%	25.0%	12.6%	7.4%	18.2%	15.4%	12.1%	17.2%
Rarely	16.3	12.5	15.8	22.2	12.1	16.9	15.7	13.9
Sometimes	21.5	20.8	21.6	14.8	22.2	24.6	23.8	20.5
Most of the time	24.7	12.5	25.2	29.6	26.3	20.0	23.4	23.0
Always	22.2	29.2	24.8	25.9	21.2	23.1	25.0	25.4

Exhibitors were asked if, upon returning home from an exhibition event, they quarantine their show animal(s) from other animals on their property. Those that responded that they do self-quarantine were asked to indicate the duration of quarantine of their show animal(s). Ideally, exhibition animals would be quarantined for at least 21 days after returning to home prevent the possibility of spreading disease from the exhibition animals to the home herd. Exhibitors were given time periods in seven day increments as it can be intuitive to think of periods of time in weeks. Results of these questions are shown in Table 3.10.

Table 3.10. How long exhibitors quarantine their animals for once returning home from an exhibition.

Do not quarantine	1 – 7 days	8 – 14 days	15 – 21 days	>21 days
513 (69.6%)*	89 (12.1%)	67 (9.1%)	12 (1.6%)	56 (7.6%)

*153 families (20.8%) said they do not quarantine because they do not have other non-4-H animals on their property

Out of 735 responses, 49 families (6.6%) said they took other biosecurity measures after an exhibition event that were not listed in the previous questions (Figure 3.9). Of those, 48 provided a description of their practices. Responses included bathe and dust poultry for parasites; bathe livestock before returning them to their home pens; not bring any animals home from the county fair; give livestock antibiotics; keep family members who went to the fair out of the home swine barn for 48 hours minimum after returning home; deworm livestock; disinfect animals when removing them from the trailer; monitor animals for signs of illness; clean bedding out of the trailer at a site away from the home premises; always keep show animals separate from other animals at home; spray animals with an anti-fungal spray; and treat animals with a pour-on insecticide.

Exhibitors were asked if they work with a veterinarian to protect the health of their 4-H animal(s). Results are shown in Table 3.11.

Table 3.11. Working relationship status exhibitors have with a veterinarian to care for their 4-H animal(s).

Relationship with a Veterinarian	Families
We work with a veterinarian to protect the health of our 4-H animal(s)	566 (76.8%)
We know a veterinarian we could call if we needed assistance with our 4-H animal(s)	170 (23.1%)
We do not know a veterinarian we could call for assistance with our 4-H animal(s)	0
Unsure	1 (0.1%)

Exhibitors were asked if they had other livestock or horses at home in addition to their 4-H animal(s). Results are shown in Table 3.12.

Table 3.12. Non-4-H animals that exhibitors have at home.

Non-4-H Animals at Home	Families
Livestock	315 (43.1%)
Horses	54 (7.4%)
Livestock and Horses	213 (29.2%)
No other animals at home	148 (20.3%)

Exhibitors that indicated they showed horses were asked if they vaccinated their horse(s) against Equine Herpesvirus-1 (EHV-1). There are multiple commercial vaccines available for EHV-1, but they are commonly referred to as the “rhino vaccine” by horse owners. If their horses had been vaccinated, they were asked how often they give the EHV-1 vaccine to their horse(s). Results are shown in Table 3.13 and Table 3.14, respectively.

Table 3.13. Number of exhibitors that have ever vaccinated their horse(s) against EHV-1.

Yes	No	Don't know
140 (85.4%)	8 (4.9%)	16 (9.7%)

Table 3.14. How often exhibitors that do vaccinate against EHV-1 vaccinate their horse(s).

Every 6 months	Every 7 to 12 months	Greater than every 12 months	Don't know
11 (7.8%)	102 (72.9%)	20 (14.3%)	7 (5%)

Limitations of the Survey

Although this survey provided useful information, it did have its limitations. Convenience sampling was used to collect data due to the inability to contact all youths that showed animals at exhibitions in Kansas in 2016. 4-H members enrolled in an animal project during the 2015 – 2016 year were selected as the convenience sample as they were able to be contacted through email. While 4-H members do make up a significant portion of youth exhibitors in Kansas, they are not the only youth exhibitors in Kansas. Children belonging to Future Farmers of America as well as children that show in the open classes also contribute to the youth exhibitor population in Kansas. The 4-H exhibitors’ responses may not accurately reflect the knowledge and practices of the entire youth exhibitor population in Kansas.

There was also the potential for response bias, meaning the information that was collected may be biased due to a difference between those who chose to respond to the survey and those who chose not to respond to the survey. Responders to the survey were likely families who use their email regularly and feel comfortable using the online survey format. Responders also might have had a desire to take the survey to help improve their 4-H experience; or they might already have an understanding of the importance of biosecurity. Although submissions were anonymous, and IP addresses were not collected, non-responders may have not taken the survey due to privacy concerns. They may also have just been disinterested. Overall, there are many factors could have played a role in why some families chose to respond to the survey, and some families did not.

The response rate for the survey was lower than we would have liked at only 24%. Online surveys are typically considered successful when they have a response rate of 30% or greater. Using a mixed-mode survey may have improved the response rate, but we were limited to using only email. However, using email alone has its benefits, including protecting the identities and personal information of the 4-H members. It was also the most practical, inexpensive, and easiest to implement method of survey distribution. Mailing paper surveys, however, may have improved the response rate from those 4-H members who do not use email frequently or who did not feel comfortable answering an online survey. Another factor that may have contributed to the low response rate is that the survey was sent out around the Thanksgiving holiday; and families may have deprioritized completing the survey.

Findings

A higher response rate would have been preferred to capture information from more 4-H members in the state. Due to privacy reasons, survey responders were not asked to provide their county of residence. This information would have defined biosecurity knowledge and practices by county to determine which county or regional extension offices should focus more on outreach.

From the information collected, the following gaps in youth biosecurity knowledge and practices were identified:

- Lack of general understanding of disease transmission and biosecurity principles,
- The importance of quarantining exhibition animals upon returning home from events,
- The benefits to avoiding sharing equipment with other exhibitors, and
- The importance of disinfection in preventing disease spread.

In the parameters that were analyzed, there did not appear to be a difference in biosecurity measures depending on the species of animal shown. The analysis was limited due to the type of data output from Formsite, but there were no general trends in biosecurity practices that varied by species. Most of the exhibitors that responded to the survey reported having a good working relationship with a veterinarian. These numbers are promising, as working with a veterinarian should always be emphasized as an important part of owning livestock and horses.

A majority of equine exhibitors reported that their horses have been vaccinated against EHV-1; this is a reassuring finding. EHV-1 is a disease of concern in horses, as there are some strains of the virus that cause neurological disease. There are some equine exhibition events in the country that currently have an EHV-1 vaccination requirement for entry; however, many do not. It is unknown whether any equine events in Kansas have this requirement. This question was posed at this time to get a feel for the current practices of youth exhibitors in Kansas.

Recommendations

Exhibition events were the main focus of this survey, as they are common events where commingling of animals from multiple locations occurs. They are considered high-risk events for animals contracting infectious and/or contagious diseases. The dispersion of these animals to multiple destinations could make a disease outbreak at one of these events catastrophic, which is one of the main reasons for taking biosecurity precautions at these events. Practicing good biosecurity measures, however, are beneficial for more than just exhibition events. Biosecurity should always be considered when introducing new animals to a herd, when hiring farm employees who have their own animals at home, and when bringing animals home from any offsite location. Learning how to protect the health of their own animals will allow 4-H exhibitors to do their part to protect the health of the state and national herd or flock. Our

recommendations for the information that should be included in future educational materials for youth livestock exhibitors are listed below:

1. Species of interest – The species recommended to be included in future educational materials are beef cattle, dairy cattle, meat goats, dairy goats, sheep, swine, poultry, horses, and rabbits. As mentioned previously, rabbits were not included in the data collection, but the importance of the health of all species is should be understood, and rabbits should be included to teach proper biosecurity to all youth exhibitors, particularly if they are a popular 4-H animal project.
2. Disease transmission – Understanding how diseases are transmitted between animals is foundational knowledge that will make the biosecurity recommendations more logical for exhibitors. If exhibitors understand how diseases are spread among animals, they will be more cognizant when it comes to practicing good biosecurity. Diseases can be spread through direct animal-to-animal contact; indirect contact with urine, feces, nasal discharge, saliva, and semen; or via fomites, such as feed tubs, halters, bedding, panels, cages, etc. Diseases can also be spread through blood, most commonly by re-using needles and syringes. Some diseases are also spread between animals by vectors such as mosquitoes, ticks, and flies. Others can be aerosolized and spread through the air. Veterinarians have a thorough understanding of disease transmission and can be an excellent resource for educating exhibitors. Domestic diseases that exhibitors should be aware of include bovine viral diarrhea virus, brucellosis, clostridial diseases, contagious ecthyma (orf or sore mouth), equine herpesvirus-1, equine infectious anemia, erysipelas, leptospirosis, pinkeye, pseudorabies, ringworm (club lamb fungus), *Salmonella pullorum* and *Salmonella typhoid*, swine influenza, tuberculosis, and warts. Exhibitors should also be educated about foreign animal diseases including, but not limited to, avian influenza, classical swine fever, foot and mouth disease, and glanders.
3. Relationship with a veterinarian – Continue to emphasize that exhibitors should have a good working relationship with a veterinarian to care for their 4-H livestock and horses. This is important, as they are typically the best resource for animal health and biosecurity

information. While the results showed that most 4-H families work with or know a veterinarian, those results only represent 24% of the target population and it is unknown if the other 76% of 4-H families work with a veterinarian.

4. Quarantining show animals when returning home – Quarantining animals that have been at an exhibition event from other animals on the home premises is one of the most effective ways to prevent disease spread from an exhibition event to livestock and horses at home. A veterinarian can help an exhibitor set up quarantine procedures at their farm. The quarantine period should last for a minimum of 14 days, but up to 30 days, ideally. The show animals should have their own air space, water source, and feed source away from the home animals. At a minimum, this means preventing nose-to-nose contact between show animals and the home herd or flock and providing them with a separate water and feed trough. The show animals should be cared for after all the home herd has been cared for, as to not transfer any disease from the show animals to the home herd. Separate clothes and shoes should always be worn when caring for the home herd. Separate tools and equipment should be used with the show animals. If someone must use the same tools and equipment for the home stock as well as their show animals, the tools and equipment should be cleaned and disinfected between using them with each group of animals. The show animals should also be monitored daily for signs of illness. A veterinarian should be called to examine the show animals if any of them do show signs of illness.
5. “What happens at the fair, stays at the fair” – This principle emphasizes the need to clean and disinfect anything that exhibitors bring home with them from the exhibition event. Ideally, it is recommended to not bring any feed or bedding home from the fair, as these items can act as fomites and are not able to be cleaned and disinfected. Other items that must be brought home, including trucks, trailers, tools, tack, feed buckets, etc., should be cleaned and disinfected after leaving the exhibition event. All items should be cleaned (free from visible organic contamination) before being disinfected. The USDA recommends using the following disinfectants on the market for disinfecting tools and

equipment: Roccal®, Nolvasan®, or household bleach. The directions on the label should be followed carefully for best results.

KDAH has existing, species-specific basic biosecurity factsheets for exhibition animals. These are available to the public and can be used by KSRE in their education program. These factsheets can be found at this webpage: agriculture.ks.gov/AnimalHealthBiosecurity. The Kansas State Fair has also been provided with customized versions of these factsheets in both electronic and hard copy to distribute to their exhibitors as they see fit.

Chapter 4

Zoonotic Disease Risk at the Kansas State Fair

Animal exhibition events inherently place visitors at an increased risk for contracting zoonotic diseases due to the close contact with animals and their environments. There have been numerous outbreaks related to animal contact events such as these in the United States. A systematic review of the data from the U.S. Foodborne Disease Active Surveillance Network estimated that 450,000 enteric illnesses are caused by animal contact annually (Hale et al. 2012). These illnesses alone are due to the following seven pathogens: Shiga-toxin producing *E.coli* (STEC) O157, STEC non-O157, *Campylobacter*, *Listeria monocytogenes*, non-typhoidal *Salmonella*, *Yersinia enterocolitica*, and *Cryptosporidium* (Hale et al. 2012). This count does not include the annual caseload of non-enteric zoonotic diseases such as rabies, influenza, and ringworm (club lamb fungus) due to animal contact (NASPHV Animal Contact Compendium Committee 2013).

Seven states, including New Jersey, New York, North Carolina, Pennsylvania, Utah, Washington, and Wisconsin, currently have laws requiring hand hygiene stations be provided for visitor use at animal contact exhibits. The regulations range in coverage from specifying where the station must be placed to requiring a sign encouraging hand hygiene to the placement of the hand hygiene sign (CDC Office for State, Tribal, Local and Territorial Support 2016). Kansas does not have any laws about hand hygiene stations or other zoonotic disease risk mitigation strategies for animal contact exhibits. This does not mean, however, that these events should not be proactive in doing their part to protect public health.

A comprehensive biosecurity plan was designed for the Kansas State Fair (the Fair) by a previous KDAH intern in 2015. This plan focused on animal health as well as public health at the Fair. However, due to the previous intern's unfamiliarity with the fairgrounds, the public health section of the plan was not tailored to the Fair's current facilities. During the development of this section of the plan, it was also noted that the zoonotic disease risk present on the fairgrounds was largely unknown. It was at that time an observational study of facility design and visitor behavior

was deemed necessary to more accurately quantify the zoonotic disease risk at the Fair. The study was to be designed over the summer of 2016 and then implemented at the Fair that fall.

The observational study was focused on the major animal exhibits on the fairgrounds and did not include any assessment of the food vendors. The data from the study would be used to revise the public health section of the Fairs' biosecurity plan. The main objective of these updated recommendations would be to protect public health while still encouraging visitors to interact with and learn about animal agriculture. While there has not been any documented zoonotic disease outbreaks among visitors at the Fair over its 113 year history, it would just take one to potentially tarnish the Fair's reputation. This updated plan would hopefully assist them in maintaining their clean record and upstanding reputation.

The observational study design was based on two different studies— one at petting zoos in Kansas and Missouri, and one at petting zoos in Tennessee. These both involved monitoring visitor behavior at animal contact exhibits (Erdozain et al. 2013; McMillian et al. 2007). The study and its results are summarized in the report below. The report, prepared for the Kansas State Fair's administration, also includes the updated public health plan with recommendations for zoonotic disease risk mitigation strategies on the fairgrounds. This plan, designed for the Fair, was based on recommendations from the NASPHV Compendium of Measures to Prevent Disease Associated with Animals in Public Settings (2013) and KDHE's Disease Prevention for Fairs and Festivals (Garrison and Martin-Webb 2016; NASPHV Animal Contact Compendium Committee 2013). The author was available to answer any questions and address any concerns the Fair had with the information in the report.

2016 Kansas State Fair Zoonotic Disease Risk Observational Survey

Introduction

The Kansas State Fair (the Fair), a tradition steeped in the state's immense agricultural history, has the largest visitor attendance of any event in Kansas. In 2016, visitor attendance totaled 359,808 people over the ten days of the Fair (Bickel 2016). The Fair is an opportunity for Kansans to learn about their state's agriculture, food supply, and the importance of the human-animal bond in the livestock industry in a fun, family-friendly environment.

As with any large livestock exhibition event, the animals at the Fair are at an increased risk of being exposed to infectious diseases. Due to this increased risk, the Kansas Division of Animal Health (KDAH) developed a comprehensive biosecurity plan for the Fair in 2015. The objective of this plan was to provide the Fair administration with guidance to address the event's biosecurity risks and develop an infectious disease control plan for use in response to an infectious disease outbreak on the fairgrounds.

Another one of the goals of the biosecurity plan was to preserve the integrity of the Fair while also protecting public health. Interaction with the exhibition animals is one of the large draws for visitors at the Fair. However, exposure to exhibition animals puts visitors at an increased risk for contracting zoonotic diseases. Interestingly, humans are also capable of transmitting diseases to animals. Human to swine transmission of influenza viruses has been documented (CDC 2014). To address the zoonotic disease risks inherent to animal exhibition events, the biosecurity plan included a section on zoonotic disease risk mitigation strategies. The biosecurity plan, overall, was designed to keep livestock healthy while at the exhibition and visitors safe while enjoying the Fair; while at the same time, not discouraging exhibitors nor visitors from attending the Fair.

During the development of the plan, it was realized that it would be difficult to fully understand the need for these risk mitigation strategies without documented evidence of risk. The purpose of this study was to describe the extent of zoonotic disease risk at the Kansas State Fair by assessing the current facilities and observing visitors' behaviors in the animal exhibits.

Having an understanding of the actual zoonotic disease risk present on the fairgrounds should encourage the implementation of zoonotic disease risk mitigation strategies at the Fair.

Methods

An assessment of the current facilities was carried out on Thursday, September 8th, one day prior to the start of Fair. The observational portion of this study was conducted over the first nine days of the Fair, Friday, September 9 through Saturday, September 17. The animal exhibits assessed in this study included the Birthing Center, the Dairy Tie Barn, the Expo Center, Expo II, the Horse Barn, the Livestock Annex, the Petting Zoo (Hedrick's Around the World in One Display), the Prairie Pavilion, the Rabbit and Poultry Barn (considered to be one exhibit for the purposes of this study), and the Sheep, Swine, and Goat Barn.

The facility assessment was conducted to evaluate the current zoonotic disease risk mitigation strategies already in place in the animal exhibits. Areas of assessment included number, location, and description of hand hygiene stations, trashcans, and educational signage about zoonotic disease risk and hand hygiene; visitor entrances and exits to each exhibit; and the location of concession stands.

The observational study included observing and recording behaviors performed by visitors inside each animal exhibit for a certain period of time each day. The time of day of the observation period for each exhibit on each day was determined by the livestock and horse show schedules. The objective was to visit each exhibit during times of high visitor traffic in order to collect the most information. The two types of behavior monitored were hand hygiene behavior and high-risk behaviors.

Hand hygiene behavior was observed in each exhibit for 30 minutes each day. The observer was located in a position near at least one hand hygiene station where they were close enough to observe visitor behavior without disrupting traffic flow. Visitors that walked by (passed within five feet of) a hand hygiene station, either on their way out of an exhibit or on their way to a concession stand inside an exhibit, were observed to see whether they cleaned their hands or not. A "yes" or "no" was recorded by the observer on whether or not each visitor

used the hand hygiene station. The hand hygiene stations were assessed every day at the beginning of each observation period to determine if they were stocked for visitors' use.

High-risk behaviors performed by visitors were observed and recorded in each exhibit for 30 minutes each day as well. A high-risk behavior is any behavior that puts a person at increased risk of contracting a zoonotic disease. Each behavior was only recorded once per visitor; however, the same visitor could perform multiple behaviors. High risk behaviors monitored in each exhibit included eating and/or drinking; using pacifiers or teething toys (children only); touching the animals; being licked by an animal; touching animal enclosures with hands; touching animal enclosures with faces or mouths; touching hands to face (e.g., rubbing eyes, biting nails, or sucking thumb); falling down or sitting on the ground; and stepping in manure. Additional behaviors monitored for in the Petting Zoo included feeding the animals; eating the animal feed; and touching or picking up animal feces.

The number of visitor-owned fomites observed in the exhibits were also recorded during the 30 minute observation period for high-risk behaviors. Fomites are inanimate objects capable of carrying and spreading disease. These included items such as strollers, wagons, walkers, canes, wheelchairs, electric scooters, and dogs. These items come in contact with contaminated surfaces at the Fair and have the potential to carry diseases home with visitors. Manure and other organic material can contaminate the wheels and feet of these objects, which can easily be transferred to the floors in a home and serve as a source of disease.

Hand hygiene and high-risk behaviors were recorded by whether they were performed by adults or children. For this study, children were defined as anyone looking to be 12 years old or younger. This is not a precise definition of children, but it was determined to be sufficient for the information being sought in this study. Some misclassification due to the broad definition of the category, as well as natural inter-observer variance, was expected.

If there were no animals in an exhibit on a particular day, then visitor behavior was not monitored in that exhibit that day. As visitors typically only go into animal exhibits when animals are present, the absence of animals would indicate little-to-no visitor traffic flow through

an exhibit. Time and effort were focused on collecting informative data; time spent monitoring empty exhibits was minimized.

Descriptive statistics were used to summarize the data of observed hand hygiene and high-risk behaviors, hand hygiene stations, trashcan availability, and signage. Analytical statistics were not able to be reported due to the limitations of the data collection.

Results

Facilities

Animals housed in the ten animal exhibits evaluated during the 2016 Kansas State Fair for the public to interact with included cattle (adults and calves), sheep, goats (adults and kids), horses, pigs (adults and piglets), llamas, chickens (adults and chicks), turkeys, ducks (adults and ducklings), pigeons, alpacas, Zebu, water buffalo, donkeys, nilgai (adult and fawn), a bison calf, a yak calf, a zebra, a tortoise, a kangaroo, a porcupine, and a cavy.

Concession stands are located inside the Prairie Pavilion and the Expo Center. The Prairie Pavilion concession stand, Cattleman's Café, is accessible from both inside and outside the exhibit. The Expo Center concession stand, The Feed Bunk, is only accessible from inside the exhibit. Outdoor concession stands are located along most of 20th Avenue, in close proximity to the other animal exhibits.

The number of hand hygiene stations present in each barn can be found in Table 4.1. There were two types of hand hygiene stations at the Fair: hand sanitizing stations and handwashing stations. Each hand sanitizing station had two hand sanitizer dispensers and two identical signs encouraging hand hygiene behavior. The signs read, "Always wash hands: after touching animals or their living areas; after leaving the animal area; after taking off dirty clothes or shoes; after going to the bathroom; and before preparing foods, eating or drinking." These signs are displayed in English only. An image of this sign can be found in the Appendix 7. The only handwashing station found inside of an animal exhibit, apart from restrooms, was located in the Birthing Center. The exhibits with restrooms located inside of them included the Dairy Tie

Barn, the Expo Center, the Prairie Pavilion, the Rabbit and Poultry Barn, and the Sheep, Swine, and Goat Barn.

Table 4.1. Number of hand hygiene stations present in each animal exhibit.

Animal Exhibit	Hand sanitizing stations	Handwashing stations*
Birthing Center	2	1
Dairy Tie Barn	2	0
Expo Center	2	0
Expo II	0	0
Horse Barn	0	0
Livestock Annex	2	0
Petting Zoo	3	0
Prairie Pavilion	5	0
Rabbit and Poultry Barn	3	0
Sheep, Swine, and Goat Barn	2	0

*Does not include restrooms

Supplies at the hand hygiene stations were assessed every day to determine if the stations were being adequately maintained. During the observation period, the number of visitors who attempted to use a hand hygiene station, but were unsuccessful due to inadequate supplies, was recorded. These results can be found in Table 4.2.

Table 4.2. Hand hygiene station maintenance and unsuccessful visitors attempts at hand hygiene throughout the duration of the Fair.

Animal Exhibit	Percent of time hand hygiene stations were fully stocked*	Number of times visitors were unable to clean hands*
Birthing Center	55.6% (5/9)	20
Dairy Tie Barn	100% (1/1)	0
Expo Center	88.9% (8/9)	13
Livestock Annex	75% (3/4)	1
Petting Zoo	55.6% (5/9)	45
Prairie Pavilion	71.4% (5/7)	0
Rabbit and Poultry Barn	77.8% (7/9)	1
Sheep, Swine, and Goat Barn	100% (6/6)	0

*During the observation periods

A summary of the number of major visitor entrances/exits of each animal exhibit and the presence of a trashcan at each major visitor entrance can be found in Table 4.3. Many of the doors were used as both an entrance and an exit by visitors, and therefore, a distinction could not be made between the two. The doors used for unloading livestock and horses were not

considered to be major visitor entrances/exits. The majority of these doors were located on the south side of the buildings. Doors to an exhibit were also excluded if they were not easily accessible from major foot traffic ways of visitors. A trashcan was considered to be near an entrance if a visitor would walk by the trashcan either right before or after they entered an animal exhibit, but before they approached any animals.

Table 4.3. Number of major visitor entrances and/or exits and location of trash cans in each animal exhibit.

Animal Exhibit	Major visitor entrances/exits	Trashcans near every major visitor entrance (yes/no)
Birth Center	3	yes
Dairy Tie Barn	7	yes
Expo Center	3	no
Expo II	4	no
Horse Barn	7	no
Livestock Annex	3	no
Petting Zoo*	2	no
Prairie Pavilion	4	no
Rabbit and Poultry Barn	12	yes
Sheep, Swine, and Goat Barn	5	no

*The goat pen at the Petting Zoo was open to the outside; visitors did not have to use an entrance to access them.

Public Education

A summary of the observed signage in each animal exhibit can be found in Table 4.4. Hand hygiene signs were defined as signs that encouraged hand hygiene behavior by visitors after having contact with animals or their environment. Zoonotic disease risk signs were defined as signs that educated fairgoers about zoonotic diseases and/or symptoms, the types of high-risk behaviors that increase risk for contracting a zoonotic disease, and the most susceptible populations to zoonotic diseases. They had to address all three of these components to be considered a zoonotic disease risk sign.

Table 4.4. Presence of signs about hand hygiene and zoonotic disease risk in each animal exhibit.

Animal Exhibit	Hand hygiene signs (number present)*	Zoonotic disease risk signs (number present)
Birth Center	yes (9)	no
Dairy Tie Barn	yes (10)	no
Expo Center	yes (14)	no
Expo II	yes (1)	no
Horse Barn	yes (3)	no
Livestock Annex	yes (4)	no
Petting Zoo	yes (7)	yes (1)
Prairie Pavilion	yes (23)	no
Rabbits and Poultry Barn	yes (19)	yes (7)
Sheep, Swine, and Goat Barn	yes (11)	no

*Includes the signs present on the hand sanitizer stations.

The zoonotic disease risk sign in the Petting Zoo read, “WARNING: When entering a potential risk area, avoid hand-mouth activities. Contact with animals may possibly cause diarrhea, hemorrhagic colitis, renal failure, and death. Small children, pregnant women, elderly, and the immune deficit are the most susceptible. ENTER AT YOUR OWN RISK.” The sign was bright orange and easily legible as visitors approached the Petting Zoo entrance. An image of this sign can be found in Appendix 7.

The zoonotic disease risk signs in the Rabbit and Poultry Barn also contain all three defined components of a zoonotic disease risk sign. These signs addressed what zoonotic disease poultry can carry, the susceptible populations for contracting disease, and behavior modifications to help prevent disease. These signs, however, were only 8.5” x 11” and had small font; they were difficult to read unless the reader was standing directly in front of them. An image of this sign can be found in Appendix 7. Some educational signs were present in the other animal exhibits, but they did not address all three components needed for them to be defined as zoonotic disease risk signs.

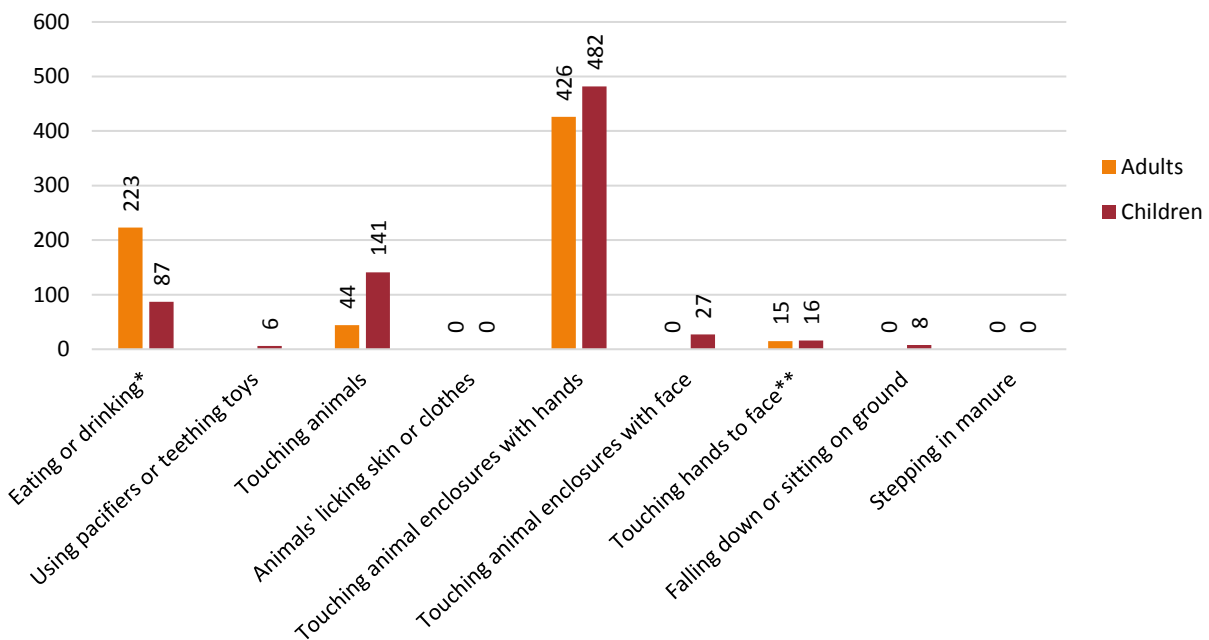
The hand hygiene signs located on the hand sanitizing stations were described previously. There were two other hand hygiene signs present in most of the exhibits. The first one read, “Because we care about your health, please wash your hands after any animal contact.” This message is displayed in English and Spanish. These signs have an adequate hand hygiene message, but they were small, approximately 12” x 12”, and used very small font. They were not

visible, nor legible, from a distance of five feet. An image of this sign can be found in Appendix 7. The second sign found in most exhibits read, “Reduce Your Risk. Wash your hands after touching the animals or their environment. No hand-to-mouth contact, such as eating, smoking or nail biting. Use special caution if you are pregnant, elderly, have children under 5 or have an existing health condition.” These signs are larger, approximately 12” by 18”, and have larger font that was easily read from a distance of five feet. They encourage hand hygiene behavior, but only discuss two of the three components of a zoonotic disease risk sign. An image of this sign can be found in Appendix 7.

High-Risk Behaviors

A summary of the high-risk behaviors observed being performed by visitors in each animal exhibit over the entire observation period of each animal exhibit during the Fair can be found in Figures 4.1 – 4.9 below. The Horse Barn was excluded from the high-risk behavior observation portion of the study as there was very little, if any, visitor traffic through the exhibit. Expo II and the Dairy Tie Barn were only monitored for one day as there was very little visitor traffic through those exhibits during the remaining eight days. The other exhibits were monitored every day that there were housed animals and/or visitors in the exhibit.

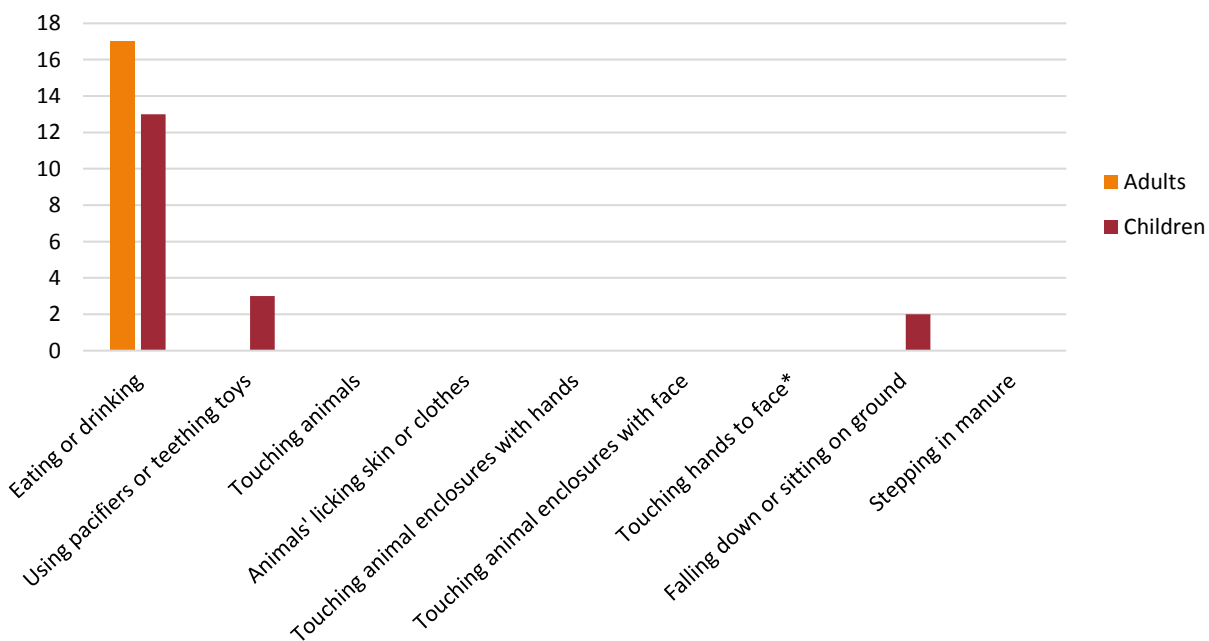
Figure 4.1. Total number of high-risk behaviors observed being performed by visitors in the Birthing Center over nine days of observation.



*One notable observation was children eating ice cream cones while touching few-day old chicks.

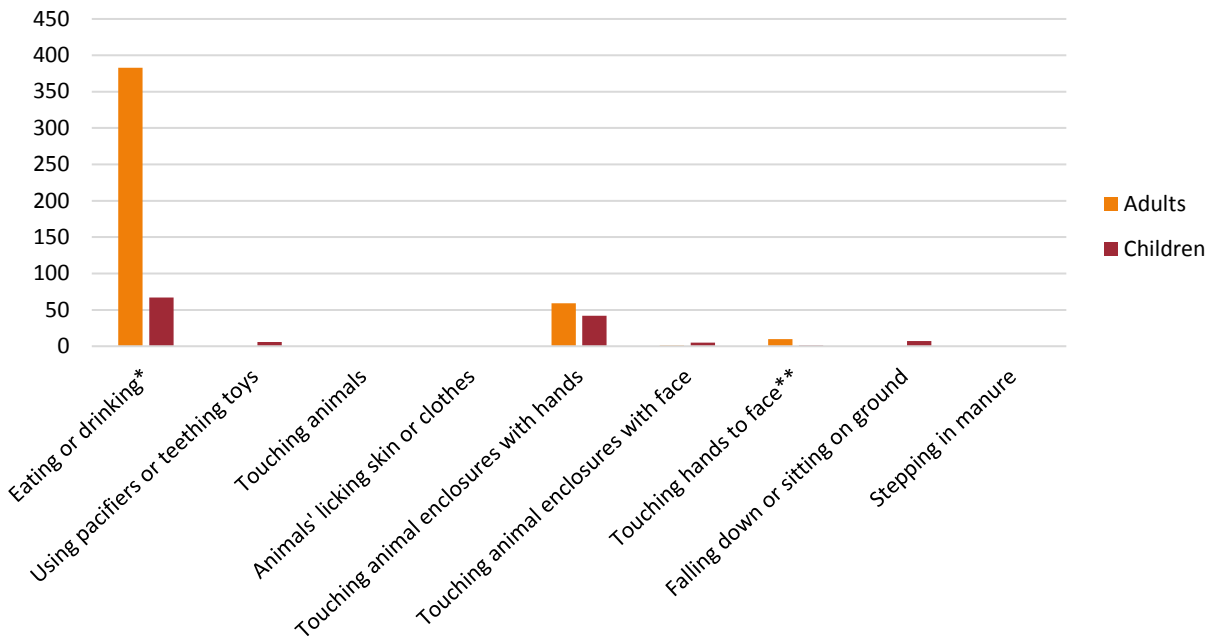
**Behaviors include biting nails, rubbing eyes, sucking thumb, etc.

Figure 4.2. Total number of high-risk behaviors observed being performed by visitors in the Dairy Tie Barn over one day of observation.



*Behaviors include biting nails, rubbing eyes, sucking thumb, etc.

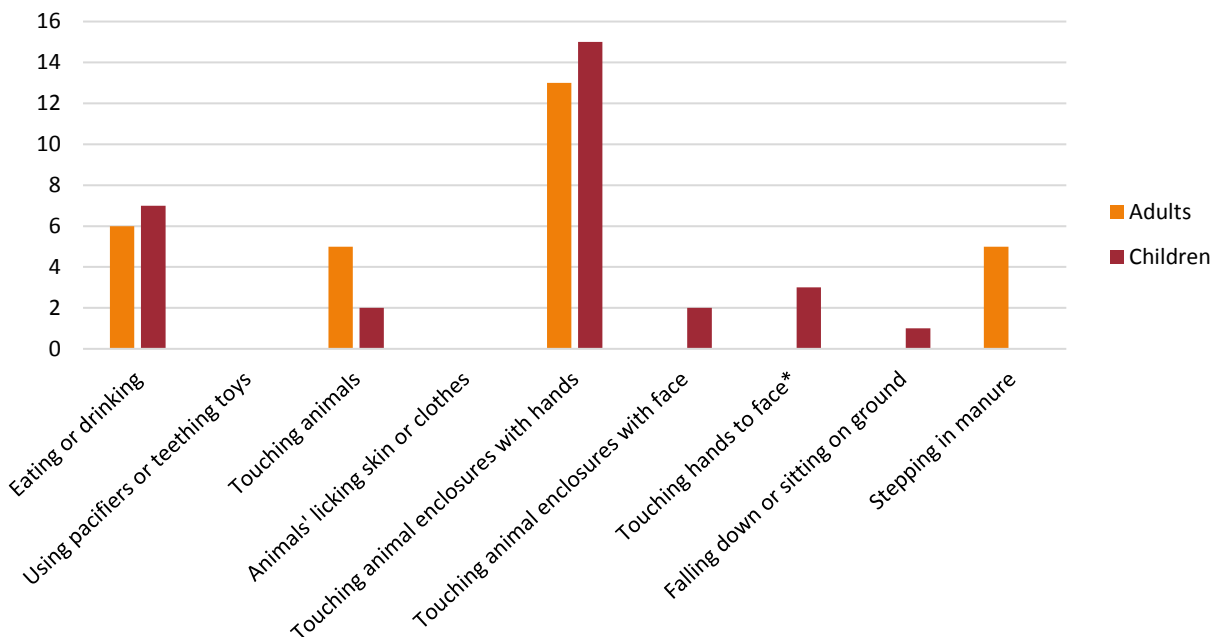
Figure 4.3. Total number of high-risk behaviors observed being performed by visitors in the Expo Center over nine days of observation.



*"The Feed Bunk" concession stand is located inside this exhibit.

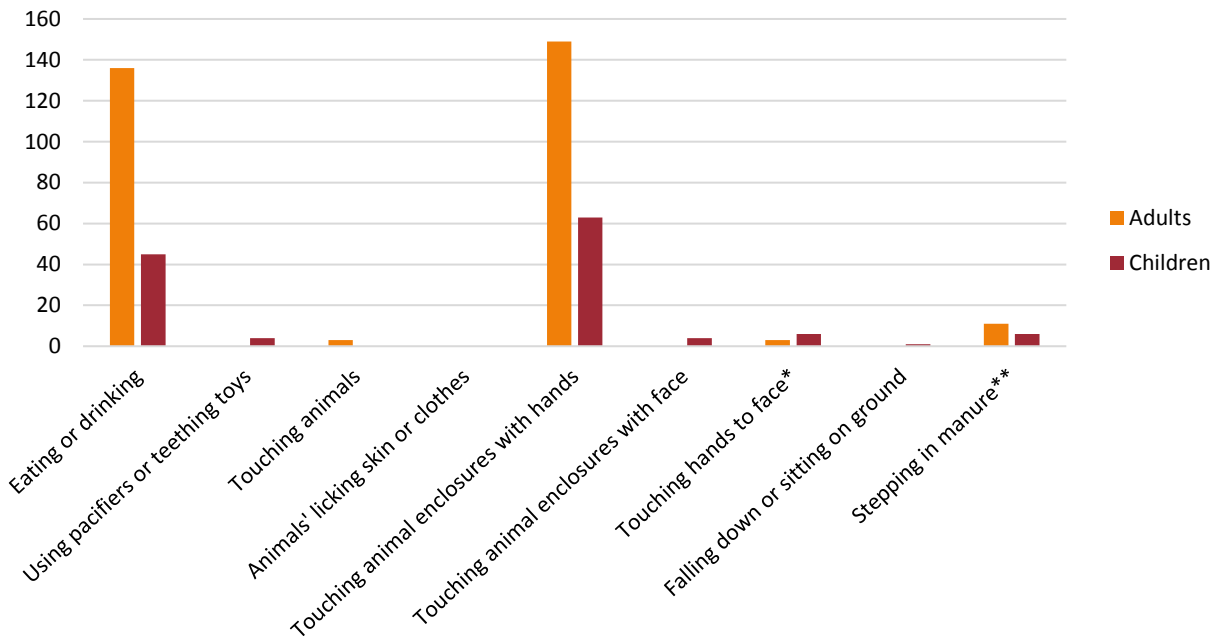
**Behaviors include biting nails, rubbing eyes, sucking thumb, etc.

Figure 4.4. Total number of high-risk behaviors observed being performed by visitors in Expo II over one day of observation.



*Behaviors include biting nails, rubbing eyes, sucking thumb, etc.

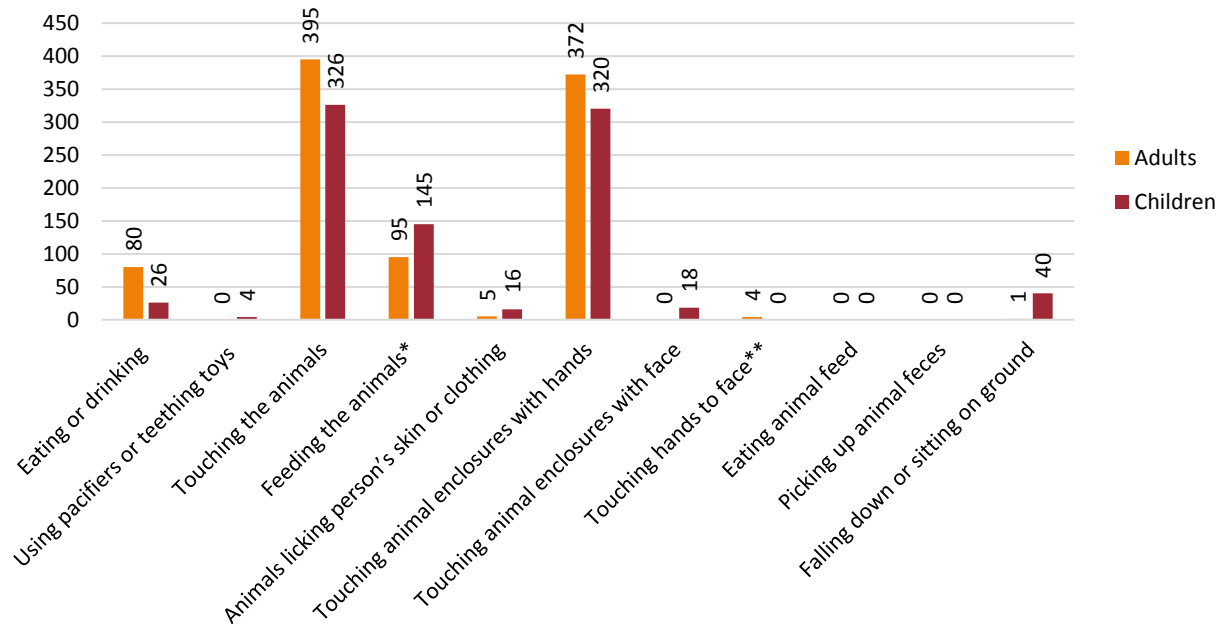
Figure 4.5. Total number of high-risk behaviors observed being performed by visitors in the Livestock Annex over four days of observation.



* Behaviors include biting nails, rubbing eyes, sucking thumb, etc.

**This is likely a gross underestimate. There were shavings (bedding) in the walkways during the goat shows and manure and straw on the walkways during the Watusi and Longhorn display.

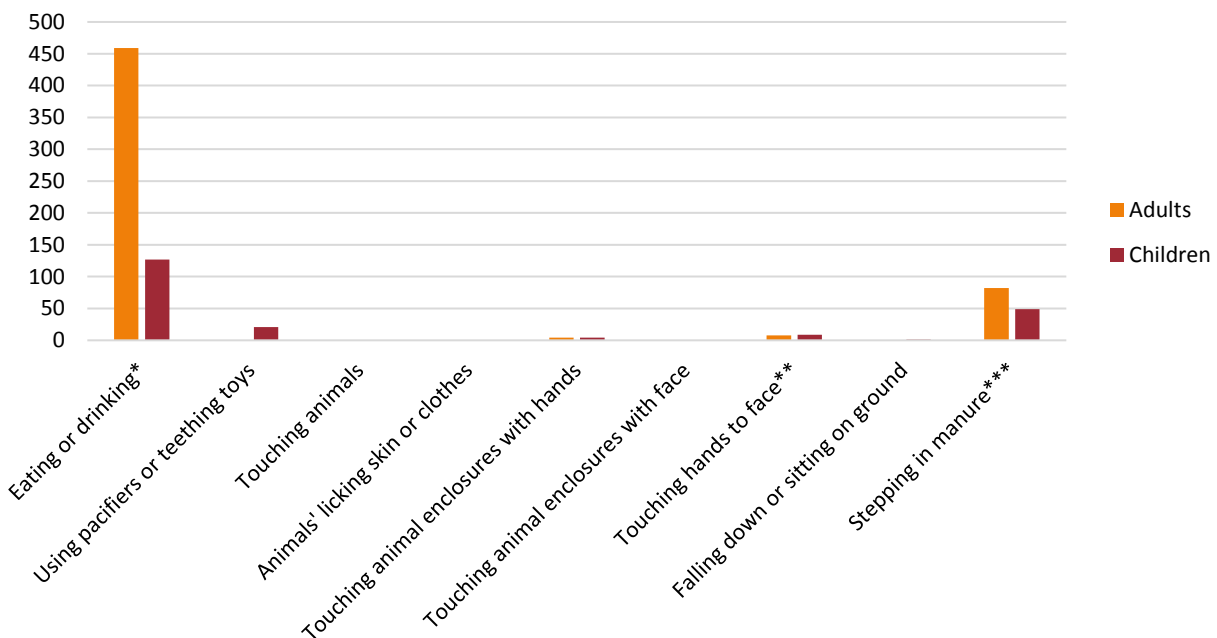
Figure 4.6. Total number of high-risk behaviors observed being performed by visitors in the Petting Zoo over nine days of observation.



*Feeding the animals either with their hands or the shovels provided by the Petting Zoo.

**Behaviors include biting nails, rubbing eyes, sucking thumb, etc.

Figure 4.7. Total number of high-risk behaviors observed being performed by visitors in the Prairie Pavilion over seven days of observation.

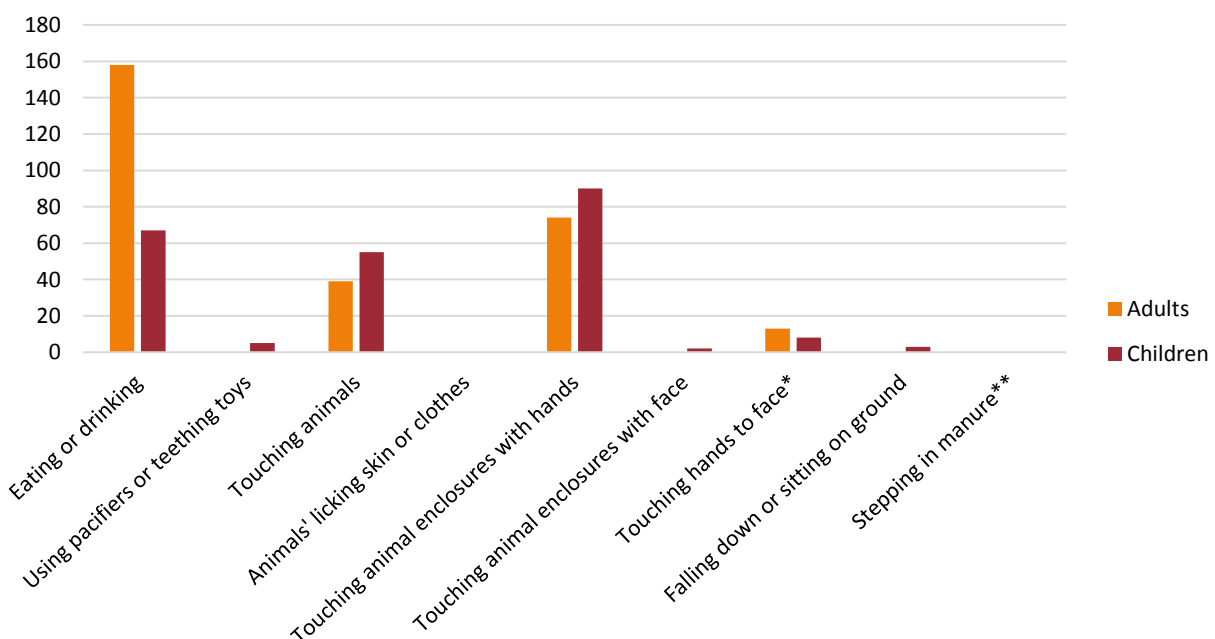


*The "Cattleman's Café" concession stand is located inside this exhibit.

**Behaviors include biting nails, rubbing eyes, sucking thumb, etc.

***This is likely a gross underestimate. The walkways were often covered in manure due to exhibitors walking their cattle to and from the wash rack and show ring.

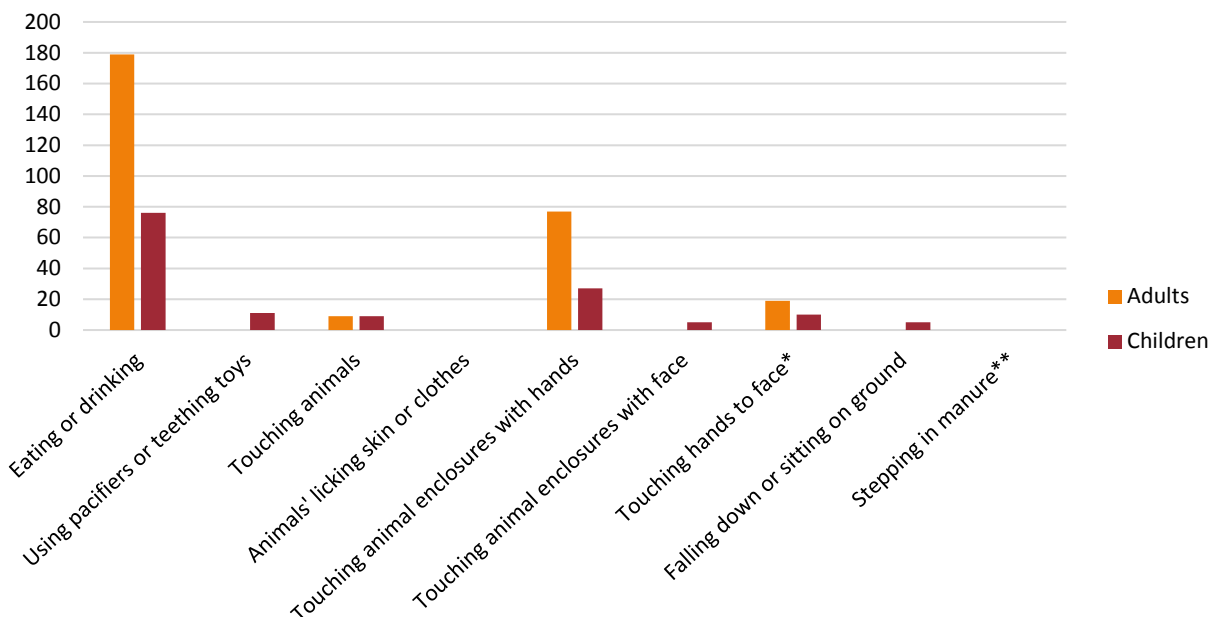
Figure 4.8. Total number of high-risk behaviors observed being performed by visitors in the Rabbit and Poultry Barn over nine days of observation.



*Behaviors include biting nails, rubbing eyes, sucking thumb, etc.

**This is likely a gross underestimate. The walkways were often covered in litter and shavings (bedding) from the bird cages.

Figure 4.9. Total number of high-risk behaviors observed being performed by visitors in the Sheep, Swine, and Goat Barn over nine days of observation.



*Behaviors include biting nails, rubbing eyes, sucking thumb, etc.

**This is likely a gross underestimate. The walkways were often covered in shavings (bedding) from the animal pens.

The total number of fomites observed in each exhibit can be found in Table 4.5. These numbers reflect the total count during the total observation period for each exhibit. Observation periods ranged from one to nine days. Dogs were included as fomites as their fur, paw pads, collars, and leashes are capable of carrying and transmitting disease to humans. They were classified as service or non-service dogs based on outward appearances only. The Horse Barn is excluded from this table as there was never an observation period in that exhibit.

Table 4.5. The total number of fomites observed in each animal exhibit during its observation period.

Animal Exhibit	Strollers and Wagons	Walkers and Canes	Wheelchairs and Scooters	Total Dogs (Service Dogs)*
Birthing Center	171	16	44	0
Dairy Tie Barn	5	0	0	1 (1)
Expo Center	95	20	37	4 (3)
Expo II	9	0	0	0
Livestock Annex	52	2	4	1 (0)
Petting Zoo**	16	4	8	0
Prairie Pavilion	107	8	33	10 (5)
Rabbits and Poultry Barn	134	14	63	1 (0)
Sheep, Swine, and Goat Barn	89	10	18	3 (2)

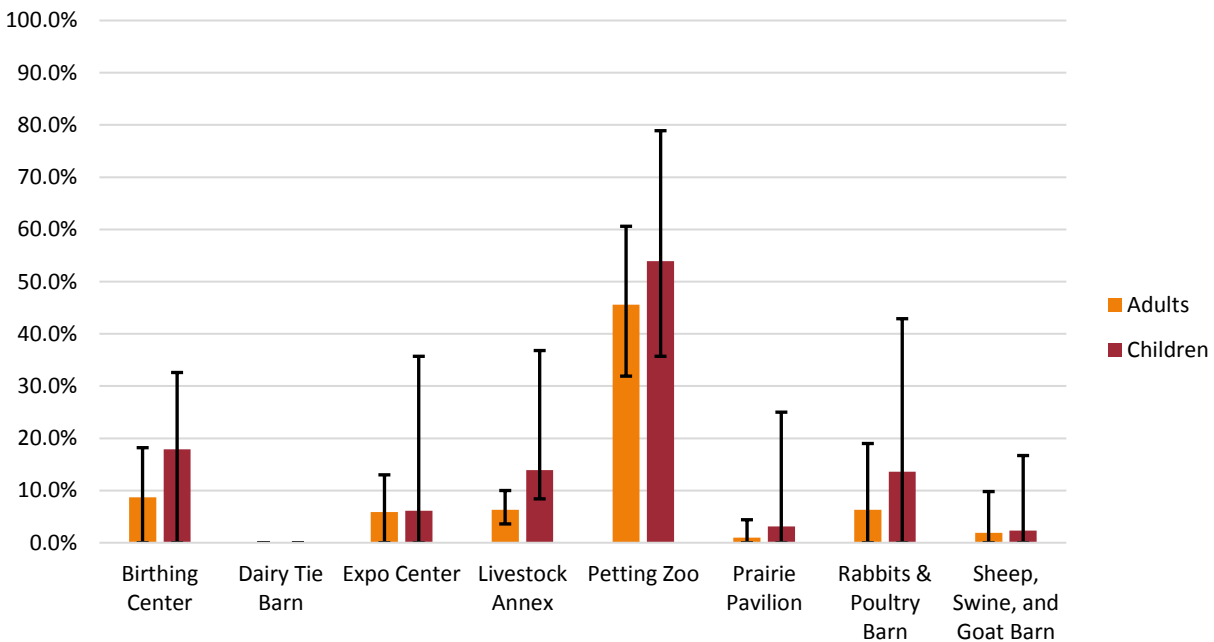
*These were the presumed to be service dogs. There was no definite way to determine if they were true service dogs or not.

**There was a designated stroller park outside the entrance of the Petting Zoo. The strollers parked there were not included in the count.

Hand Hygiene Behavior

The average percentage and range of adults and children that demonstrated hand hygiene behaviors when walking by a hand hygiene station on their way out of an animal exhibit or on their way to a concession stand within an animal exhibit can be found in Figure 4.10. Expo II and Horse Barn are excluded as they did not have any hand hygiene stations within them.

Figure 4.10. Average percentage[†] and range of adults and children that used hand hygiene stations before exiting the animal exhibit or going to a concession stand* inside each animal exhibit



[†]Percentages were averaged over the number of days each animal exhibit was observed.

*The Expo Center and the Prairie Pavilion each have a concession stand within the exhibit.

Discussion

Facility Assessment

The facility assessment provided valuable information about the current state of the animal exhibits at the Fair. There is currently an inadequate amount of hand hygiene station located in the animal exhibits. The frequent occurrence of empty hand sanitizer stations and observation of visitors' unsuccessful attempts at procuring hand sanitizer suggest that the stations are not being maintained frequently enough throughout the day.

Notable information was missing from the animal exhibits. The educational signage currently present in the animal exhibits is not sufficient. There were numerous signs encouraging hand hygiene, but very few signs that adequately explained zoonotic disease risk. There was also not any information on swine influenza in the Sheep, Swine, and Goat Barn. The Birthing Center was missing information on swine influenza and salmonella as well. This draws attention to the need for more zoonotic disease risk information in each animal exhibit. This information should be tailored to the species housed in each exhibit.

One other noticeable inadequacy was the lack of trashcans near every visitor entrance to each animal exhibits. Having access to a trashcan when entering an animal exhibit makes easier for visitors to dispose of their food and beverages before coming in contact with the animals. If eating and drinking inside the animal exhibits is to be discouraged, visitors must be provided with a means to dispose of their food and beverages prior to entering the exhibits.

Observational Study

Interacting with animals at large exhibition events like the Kansas State Fair inherently puts visitors at an increased risk of contracting a zoonotic disease. The data from this observational study provides evidence of the specific zoonotic disease risk present at the Fair. The rate of hand hygiene behavior in animal exhibits was low in both adults and children. The average percentage of adults who sanitized or washed their hands after visiting an animal exhibit ranged from 0% to 53.9% among the various exhibits. That average for children ranged from 0% to 45.6%. Poor compliance with hand hygiene behavior is a significant risk factor for contracting a zoonotic disease from an animal exhibition event. Interestingly, the Petting Zoo consistently had a markedly higher rate of hand hygiene behavior than any of the other animal exhibits. Possible reasons for this include the presence of both zoonotic disease risk and hand hygiene signage in the exhibit, visitors' understanding of the inherent risks associated with petting zoos, or a combination of both.

There was a large number of high-risk behaviors observed in all the animal exhibits. The most common behaviors seen throughout the exhibits were eating and/or drinking, touching the animal enclosures with hands, touching the animals, and feeding the animals (Petting Zoo only).

While recognizing that the opportunity to try different foods and beverages at the Fair is one of the big draws for visitors, eating and drinking inside the animal exhibits still needs to be discouraged. These hand-to-mouth behaviors increase the risk for visitors to contract zoonotic diseases. There are currently two concession stands located inside animal exhibits. Ideally, these would be relocated in the future to discourage visitors from eating and drinking in the animal exhibits. Until this is possible though, the focus in these exhibits should be on encouraging hand hygiene prior to patronizing the concession stands as opposed to purely discouraging eating and drinking. This will allow for a balance between protecting public health and supporting these vendors' businesses.

Touching and feeding the animals are behaviors expected to occur frequently inside animal exhibits. These behaviors combined with the high rate of hand-to-face behaviors people demonstrate increase the risk of contracting zoonotic diseases at the events (Nicas and Best 2008). In this study, it was difficult to closely monitor hand-to-face behaviors due to the large amount of people being observed and the density of the crowds. As a result, the true amount of hand-to-face behaviors that occurred during the observation periods was likely not appreciated. However, due to the unavoidable nature of some of these high-risk behaviors, such as touching and feeding the animals, it is essential to emphasize the importance of hand hygiene. This is especially important as it is not recommended that children under the age of five have direct contact with pre-weaned calves or live poultry (NASPHV Animal Contact Compendium Committee 2013). As this contact is unavoidable at the Fair, it is of utmost importance of educating visitors about zoonotic disease risk and encouraging hand hygiene.

A large number of visitor-owned items that could potentially act as fomites was observed in the animal exhibits. These items included strollers, wagons, walkers, canes, wheelchairs, and electric scooters. Many of these items are needed by fairgoers in order to navigate the fairgrounds comfortably and safely. To reduce the risk of some these items becoming fomites for zoonotic diseases, stroller parks should be offered outside of the animal exhibits. Because some of these items (wheelchairs, canes, walkers, etc.) cannot be left outside the exhibit, educational information should be provided to visitors about disinfecting these items before taking them back home.

Implications

Animal exhibitions, like the Kansas State Fair, put visitors at an increased risk for contracting enteric diseases, including *E. coli*, *Salmonella*, *Campylobacter*, and *Cryptosporidium*. This is especially true as ruminants have the highest shedding rates of *E. coli* and *Salmonella* during the summer and fall, the same time of year as county and state fairs in Kansas. Visitors can also potentially be exposed to other non-enteric diseases such as rabies and influenza (NASPHV Animal Contact Compendium Committee 2013). This risk should be recognized, but should not be used to cause panic or fear of animal exhibitions by visitors. The zoonotic disease risk at the Fair should be communicated to visitors, but it should also be communicated that avoiding certain behaviors and practicing good hand hygiene can easily mitigate that risk. The Fair should work to find ways to both encourage the public learn about and interact with animal agriculture, but do it in a safe manner. The current strategies are inadequate for communicating and reducing the zoonotic disease risk at the Fair. All of the right components of a risk mitigation plan are there, but they need to be augmented to truly make a beneficial impact. Strategies such as providing hand hygiene stations can also help reduce the risk of human-to-human disease transmission, especially during flu season.

Study Limitations

One limitation to this study is that the volume of data initially desired was larger than what was actually collected. The original study design allowed for two observers monitoring hand hygiene behaviors and two observers monitoring other high-risk behaviors in each animal exhibit every day. Due to lack of follow through with the study volunteers, this was not achievable. Originally, there were 11 pre-veterinary students from Kansas State University signed up to assist with five days of the study. Unfortunately, all but two of them failed to show up. There were two observers on day 3 and day 9 of the study, but only one observer for the other days of the study. Due to the limited number of observers, not all of the hand hygiene stations in each building could be monitored. The one observer was positioned in each exhibit in a location where they could observe at least one hand hygiene station. Ideally, all of the hand hygiene stations would have been monitored, but this was impossible due to the large size of the exhibits and the lack of manpower.

Another limitation was the inability to record the total number of visitors inside each animal exhibit during the observation periods. As a result, it was not possible to conduct statistical analyses at the individual level for high-risk behaviors. Factors that affected handwashing compliance, such as facility layout and perceived risk by the visitors, were also not able to be assessed during this study. Understanding how each of these affect handwashing compliance would have allowed risk mitigation strategies to be tailored for the most effective outcome.

Recommendations

The following recommendations are based on the information collected from the facilities assessment and observational study during the 2016 Kansas State Fair. These recommendations have been adapted from the biosecurity plan KDAH created for the Fair administration in 2015. The original draft should be amended with these recommendations. These were developed around the current structures and exhibits on the fairgrounds. As an assessment of the food vendors on the fairgrounds was not included as part of this study, the following recommendations do not include public health risk mitigation strategies for that aspect of the Fair.

Hand Hygiene Stations

1. It has been established that hand sanitizers are typically not effective in the presence of organic matter. Hand washing with soap and water, however, is effective for cleaning hands soiled with organic matter (CDC 2016). Currently, only the Birthing Center has a sink available for use by visitors for handwashing. Access to running water for handwashing stations is likely limited on the fairgrounds with its current facilities. Therefore, these recommendations focus on increasing the number and accessibility of hand sanitizing stations. Ideally in the future, new construction will allow for visitor handwashing facilities in every animal exhibit.
2. Increase the number of hand sanitizing stations throughout the animal exhibits. If possible, place more of these stations in the following areas:

- a. THE MAIN EXITS OF ALL ANIMAL EXHIBITS. These stations should include signage about the importance of hand hygiene after visiting an animal exhibit. The verbiage on the current hand sanitizing stations should be sufficient. Recommendations for each exhibit are listed below. Diagrams of these recommendations for each animal exhibit can be found in the Appendix.

i. Birthing Center

Current number of stations: two (2)

Additional number of stations: four (4)

Stations should be placed in each of the following locations:

- One (1) by the south door of the building
- One (1) outside by the duck pond
- Two (2) by the northeast door
- Two (2) by the northwest door

ii. Dairy Tie Barn

Current number of stations: two (2)

Additional number of stations: five (5)

Stations should be placed in each of the following locations:

- One (1) by each of the five main exits on the north side of the building
- One (1) by the west door
- One (1) by the east door

Visitor traffic is low in this exhibit, but with the presence of young calves, hand hygiene is very important.

iii. Expo Center

Current number of stations: two (2)

Additional number of stations: two (2)

Stations should be placed in each of the following locations:

- One (1) by the east door of the building

- One (1) by the northeast door
- One (1) by the northwest door
- One (1) by the concession stand, “The Feed Bunk”

iv. Expo II

Current number of stations: zero (0)

Additional number of stations: three (3)

Stations should be placed in each of the following locations:

- One (1) by the west door to the stalls
- One (1) by the north door to the arena
- One (1) by the north door to the stalls

Currently there is low visitor traffic to this exhibit, but with the move of the miniature horse exhibition in 2017, visitor traffic may increase

v. Horse barn

Current number of stations: zero (0)

Additional number of stations: three (3)

Stations should be placed in each of the following locations:

- One (1) between the two west doors
- One (1) between the two east doors
- One (1) by the middle north door

This exhibit has low visitor traffic, so not every exit needs to have a hand hygiene station.

vi. Livestock Annex

Current number of stations: two (2)

Additional number of stations: one (1)

Stations should be placed in each of the following locations:

- One (1) by the west door
- One (1) by the northeast door

- One (1) by the northwest door

vii. Petting Zoo

Current number of stations: three (3)

Additional number of stations: one (1)

Stations should be placed in each of the following locations:

- One (1) by the exit of the enclosed portion of the exhibit
- One (1) by the southeast corner of the exhibit
- One (1) by the northwest corner of the exhibit
- One (1) by the southwest corner of the exhibit

viii. Prairie Pavilion

Current number of stations: five (5)

Additional number of stations: zero (0)

Stations should be placed in each of the following locations:

- One (1) by the east door
- One (1) by the indoor seating area of the concession stand, “Cattleman’s Café”
- One (1) by the northeast door, near the concession stand
- One (1) by the middle north door (east side of arena)
- One (1) by the northwest door (west side of arena)

ix. Rabbit and Poultry Barn

Current number of stations: three (3)

Additional number of stations: five (5)

Stations should be placed in each of the following locations:

- One (1) by the southeast door on poultry side
- One (1) by the southwest door on poultry side
- One (1) by the northeast door on poultry side
- One (1) by the northwest door on poultry side
- One (1) by the southeast door on rabbit side

- One (1) by the southwest door on rabbit side
- One (1) by the northeast door on rabbit side
- One (1) by the northwest door on rabbit side

x. Sheep, Swine, and Goat Barn

Current number of stations: two (2)

Additional number of stations: three (3)

Stations should be placed in each of the following locations:

- One (1) by each of the four doors on the north side of the building
- One (1) by the west door

b. **THE FAIRGROUND EXITS.** These stations should have signage to encourage visitors to sanitize their hands prior to departing the fairgrounds and to advise visitors of the potential for zoonotic disease spread through contact with animals and their environment, as well as through fomites such as strollers, wagons, walkers, canes, wheelchairs, etc. that they take home with them.

3. When acquiring new hand hygiene stations, consider stations that minimizes the need for hand contact to dispense product. This could include motion activated or foot pedal dispensers. These should also be easily accessible to young children. The current ones are typically able to be reached by most children, although some of the very young children (up to three years old) had to be assisted with sanitizing their hands. Children, especially children under the age of five, are at a higher risk than adults to contract zoonotic diseases at fairs due to their behaviors and their naïve immune systems, so it is especially important they can access hand hygiene stations.
4. All hand hygiene stations should be stocked at minimum every morning and afternoon/evening. The Fair should consider maintaining the hand hygiene stations located in areas of high visitor flow and in exhibits with concession stands more

frequently throughout the day. These exhibits include the Birthing Center, the Petting Zoo, the Expo Center, and the Prairie Pavilion.

Facilities

1. Trashcans should be placed around all the major visitor entrances to each animal exhibit to make it easier for visitors to throw away food and drink items before entering an exhibit. These locations should be similar to the locations of the hand hygiene stations. Trashcans should be emptied as needed throughout the day.
2. Do not allow any non-exhibition dogs on the grounds except for service dogs protected under the Americans with Disabilities Act (ADA). According to the ADA, “In situations where it is not obvious that the dog is a service animal, staff may ask only two specific questions: (1) is the dog a service animal required because of a disability? and (2) what work or task has the dog been trained to perform? Staff are not allowed to request any documentation for the dog, require that the dog demonstrate its task, or inquire about the nature of the person's disability” (U.S. Department of Justice 2015). These recommendations may make it easier for Fair staff to request the removal of non-ADA service dogs from fairgrounds.
3. The walkways in the animal exhibits should be cleaned of manure, soiled bedding, shavings, and litter, and sanitized daily, or more often when needed, to reduce environmental contamination (Erdozain et al. 2015) Keeping the floors free from contaminated materials helps to prevent visitors from becoming fomites and carrying disease home with them on their shoes, strollers, walkers, wheelchairs, etc. The animal exhibits that are the worst offenders of having unkempt floors include the Livestock Annex, the Prairie Pavilion, the Rabbit and Poultry Barn (specifically, the poultry side), and the Sheep, Swine, and Goat Barn.
4. The picnic tables in the Expo Center and the Prairie Pavilion should be cleaned off and disinfected every morning of the Fair and then as needed throughout the day. The tabletops were often covered in dust from the arenas and stalls. As provided eating

surfaces inside these animal exhibits, it is important that they are kept clean and sanitary. Ideally, there should be no concession stands where food is prepared and sold for human consumption inside the animal exhibits as this increases the risk for zoonotic disease spread (Erdozain et al. 2015).

5. Ideally, meals such as the Grand Drive dinner and the beef appreciation ice cream social should not be located inside the Prairie Pavilion nor any other animal exhibit. Until these meals can be moved to a new location, hand sanitizing stations should be placed at the front of the lines for exhibitors and visitors to use before getting food. The food servers and other Fair personnel present should encourage exhibitors and visitors to practice hand hygiene prior to eating at these events.

Public Education

1. High-quality signage is needed in the animal exhibits and around the exits to fairgrounds to encourage hand hygiene and to communicate the zoonotic disease risks associated with interacting with animals. The current signs are ineffective, as they are located in inconspicuous places, lack eye-catching detail, and are displayed in small font. Signs should be located in highly visible locations and contain attention-grabbing details with font large enough to be read at a distance of five feet. One study focused on children's knowledge about disease risk on a farm before and after receiving an education program showed that children are more likely to wash their hands if they understand why hand hygiene is important (Hawking et al. 2013). Providing educational signage helps teach children and adults the reasons why hand hygiene is encouraged and necessary to maintain safe animal interactions on the fairgrounds (Erdozain et al. 2015; Hawking et al. 2013).
2. Signs about zoonotic disease risk and the importance of hand hygiene should be posted in English as well as Spanish. According to the United States Census Bureau, as of July 1, 2015, 11.6% of Kansans are Hispanic or Latino (U.S. Census Bureau 2015). Adding additional signs in Spanish may help communicate these important messages to the Spanish-speaking population of visitors.

3. Zoonotic disease risk signs should include information about the following:
 - a. **ZOONOTIC DISEASES AND/OR SYMPTOMS** –The zoonotic disease risk sign at the Petting Zoo is a good example of this. Signs in all animal exhibits should warn of enteric diseases, their clinical signs, and potential sequelae. Signs in exhibits with poultry and swine should also contain information about influenza. The Kansas Department of Health and Environment (KDHE) may be of assistance with providing the Fair with this type of information, especially the current status of influenza in Kansas at the time of the Fair.
 - b. **HIGH-RISK BEHAVIORS** – High-risk behaviors are behaviors that put visitors at risk of contracting a zoonotic disease. Not all of these behaviors should be discouraged necessarily, but visitors should be warned of the risk associated with them. Examples of these behaviors include:
 - i. Sitting on the floor of exhibits or animal enclosures,
 - ii. Using pacifiers, sippy cups, or teething toys in the animal exhibits,
 - iii. Eating and/or drinking in the animal exhibits,
 - iv. Hand-to-mouth behaviors such as rubbing eyes, biting nails, sucking thumb, applying cosmetics, etc.,
 - v. Touching animals or their enclosures/environment, and
 - vi. Stepping in manure.
 - c. **SUSCEPTIBLE POPULATIONS** – The populations of visitors most susceptible to contracting a zoonotic disease from the Fair include children under the age of five, elderly people, pregnant women, and the immunocompromised.
4. Hand hygiene signs should include information about the needs to wash or sanitize hands after touching animals or their enclosures. The goal is not to discourage visitors to interact with and learn about animals and agriculture, so the focus must be on hand hygiene following these activities. The Centers for Disease Control and Prevention have

some sample templates of hand hygiene signs that are available for public use. These can be found at <https://www.cdc.gov/handwashing/posters.html>.

5. Animal exhibitors should be provided with information on how to prevent zoonotic disease transmission to themselves and visitors. The credential packets, distributed to exhibitors before entrance to the fairgrounds, may be a good place to disseminate this information. The information should include the following recommendations:
 - a. Discourage exhibitors from sleeping or eating in the livestock exhibit areas,
 - b. Discourage exhibitors from storing food and drink items in the barns,
 - c. Encourage exhibitors to practice hand hygiene after handling animals and before eating,
 - d. Encourage visitors who touch exhibitors' animals to wash their hands after,
 - e. Encourage exhibitors to keep the aisles around their animals free of manure and soiled bedding, and
 - f. Remind exhibitors that non-ADA service animals are not allowed on the fairgrounds.
6. Public information about safety around animals and zoonotic disease risk is currently posted on the Kansas State Fair website. It can be found at the end of the "Planning Your Day" page, located under the "Education" section of the "Fair" dropdown menu (Kansas State Fair 2017). While this is an excellent place for educators to find this information, it is not in an intuitive place to look for information for families or other non-educators visiting the Fair. This is information that everyone should know before visiting the Fair; yet, the current location of this information makes it likely to be only seen by educators planning a student field trip. This information should continue to be posted on the Fair's website, however, it should be moved to a location that the general population of fairgoers will think to look for it. The website may also be a good place to post information about disinfecting fomites, such as strollers, wagons, walkers, canes, etc., before bringing them home.

Personnel

1. Having additional personnel stationed in the animal exhibits and at exits of the fairgrounds to encourage visitors to wash or sanitize their hands after visiting an animal exhibit or the Fair may help reduce the risk of zoonotic disease transmission. According to a study on Kansas and Missouri petting zoos, visitor hand hygiene compliance increases in the presence of a staff member, even if the staff member is not verbally encouraging hand hygiene (Erdozain et al. 2013). Studies have also shown that social influence plays a large part in the success of hand hygiene campaigns (Heinrich et al. 2014). Having personnel to encourage hand hygiene behavior and educate about high risk behaviors can provide that social pressure to change visitor behavior.
2. These individuals could be Fair employees or volunteers, 4-H exhibitors, or FFA exhibitors who have time to do this needed task. These individuals should have some training about zoonotic disease risk and proper hand hygiene. The Reno County Health Department or KDHE could be of assistance in training these individuals.
3. These individuals should be identified with proper Kansas State Fair identification (badge, vest, etc.). Being easily identifiable as Fair staff will make them more reliable as a source of information and give their recommendations more influence.

Outreach

1. Encourage the Reno County Health Department to be more actively involved at the Kansas State Fair. The health department can assist in training Fair personnel in the prevention of zoonotic diseases as well as help develop the educational signage for the animal exhibits. They may also be a source of funding to help purchase more hand hygiene stations.
2. KDHE could also serve as a good resource for educational, training, and funding needs. They can advise the Fair about the current influenza risk in Kansas each year. KDHE's toolkit, Disease Prevention for Fair and Festivals, was used to shape these recommendations. This document should be referenced by the Fair if they desire further

guidance. It can be found at

www.kdheks.gov/epi/download/Disease_Prevention_Toolkit.pdf.

3. Encourage 4-H extension agents and FFA advisors to educate youth exhibitors about good biosecurity practices before exhibition time at the Kanas State Fair. KDAH worked with Kansas State Research and Extension (KSRE) during the fall of 2016 to conduct a survey of 4-H animal exhibitors in Kansas about their biosecurity practices surrounding exhibition events. The results of that survey have been shared with KSRE, along with recommendations for educating their members about disease transmission and biosecurity practices at exhibition events. The Fair may want to work collaboratively with KSRE on education and outreach for these youths. Biosecurity factsheets were designed for the Fair during the summer of 2016; these can serve as a starting point for exhibitor education.

Chapter 5

Core Area Competencies

Biostatistics

This course gave me the knowledge to understand the analytical capabilities I had for my data. My data collection process was designed in a way that I could only use descriptive statistics when reporting my results, but the knowledge of how to perform analytical statistics on datasets will be invaluable for my future career.

Environmental Health Sciences

This course encouraged me to look at certain infectious and/or zoonotic diseases as environmental health issues instead of just human and animal health issues. This new viewpoint let me assess different aspects of infectious and/or zoonotic diseases that I had not considered before. The knowledge gained in this course was also applicable when discussing carcass disposal after a mass depopulation of livestock and/or poultry and cleaning and disinfection of infected premises at various times throughout my internship.

Epidemiology

These courses gave me a deeper understanding of infectious disease spread, as well as how to use data modeling to identify associations between risk factors and disease. I was able to apply this knowledge when I was developing biosecurity recommendations for youth livestock exhibitors and zoonotic disease risk mitigation strategies for the Kansas State Fair.

Health Service Administration

This course opened my eyes to the complex nature of human health care. As a veterinarian, I have only had experience with the cost and payment of veterinary care. I also now appreciate that while the individual healthcare plans do not necessarily cover the cost of creating a healthy community from a public health standpoint, they do improve the health of the community by supporting the individual and allowing for individual care in the case of a public health event. It also gave me understanding of healthcare disparities among different

socioeconomic classes and made me cognizant of the need to adjust public health campaigns to reach all groups of people, especially the underserved.

Social and Behavioral Science

This course provided me with the understanding of why people demonstrate certain behaviors and the influence that the multi-level framework of society has on human behavior. This knowledge was used to develop effective zoonotic disease risk mitigation strategies for the Fair that would most successfully reduce high-risk behaviors and increase hand hygiene by visitors.

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Appendix 1 – Species-specific Biosecurity Factsheets



BIOSECURITY

Keeping your cattle healthy

Biosecurity is another way of saying “infectious disease control.” Biosecurity is a combination of management practices designed to prevent the introduction and transmission of diseases into and throughout a herd. Infectious diseases can be transmitted by animals, people, equipment and vehicles. Livestock exhibitions are events where animals have an increased risk of getting infectious diseases due to the commingling of animals from different sources. Taking some simple precautions can help reduce that risk and keep your animals healthy. Below are some biosecurity recommendations for ensuring the health of your show cattle.



Before the Show

- Read all guidelines for each show to be sure your animals meet all entry and exhibition requirements.
- Work with your veterinarian to ensure your cattle are up to date on vaccinations.
- Evaluate your cattle's health prior to going to the show. Never take an unhealthy animal to a show. Signs of illness can include decreased appetite, fever, diarrhea, nasal discharge, coughing and blisters around the mouth, nose and/or hooves. If you see any of these signs, please contact your veterinarian.
- Take only clean and disinfected equipment to the show to prevent any potential disease transfer from your cattle to others.

During the Show

- Monitor your cattle daily for signs of illness. If you suspect your animal is sick, notify a show official right away.
- Avoid personal contact with animals other than your own.
- Do not share feed, feed/water tubs, grooming supplies or other equipment with other exhibitors at the show.
- Keep your area and equipment clean of manure contamination.
- Wash your hands frequently with warm soapy water after contact with animals or equipment.

After the Show

- Isolate the cattle you took to the show from the rest of your herd when you return home.
- The show cattle should be as far from the other animals as possible, but they need to be at least far enough away to prevent nose-to-nose contact. Your veterinarian can help you establish a good location.
- Modify your chore routine to care for your show cattle last each day. Do not share equipment between show cattle and any other animals at home.
- Monitor your show cattle daily for signs of illness, including those signs listed in the “Before the Show” section. Contact your veterinarian if any animal shows signs of illness.
- Clean and disinfect all equipment, shoes, vehicles and trailers you took to the show. Allow them to dry completely.
- Talk to your veterinarian to determine the best biosecurity practices for your cattle.

BIOSECURITY

Keeping your goats healthy

Biosecurity is another way of saying “infectious disease control.” Biosecurity is a combination of management practices designed to prevent the introduction and transmission of diseases into and throughout a herd. Infectious diseases can be transmitted by animals, people, equipment and vehicles. Livestock exhibitions are events where animals have an increased risk of getting infectious diseases due to the commingling of animals from different sources. Taking some simple precautions can help reduce that risk and keep your animals healthy. Below are some biosecurity recommendations for ensuring the health of your show goats.



Before the Show

- Read all guidelines for each show to be sure your animals meet all entry and exhibition requirements.
- Evaluate your goats' health prior to going to the show. Never take an unhealthy animal to a show. Signs of illness can include decreased appetite; fever; lameness; abscesses; circular, crusting skin lesions; or blisters on the mouth, teats, and/or hooves. If you see any of these signs, please contact your veterinarian.
- Be particularly vigilant for signs of sore mouth (orf) or fungus (ringworm) as these can be easily passed to humans.
- Take only clean and disinfected equipment to the show to prevent any potential disease transfer from your goats to others.

During the Show

- Monitor your goats daily for signs of illness. If you suspect your animal is sick, notify a show official right away.
- Avoid personal contact with animals other than your own.
- Do not share feed, feed/water tubs, grooming supplies, or other equipment with other exhibitors at the show.
- Keep your area and equipment clean of manure contamination.
- Wash your hands frequently with warm soapy water after contact with animals or equipment.

After the Show

- Isolate the goats you took to the show from the rest of your animals when you return home.
- The show goats should be as far from the other animals as possible, but they need to be at least far enough away to prevent nose-to-nose contact. Your veterinarian can help you establish a good location.
- Modify your chore routine to care for the show goats last each day. Do not share equipment between show goats and any other animals at home.
- Monitor the show goats daily for signs of illness, including those signs listed in the “Before the Show” section. Contact your veterinarian if any animal shows signs of illness.
- Clean and disinfect all equipment, shoes, vehicles and trailers you took to the show. Allow them to dry completely.
- Talk to your veterinarian to determine the best biosecurity practices for your goats.

BIOSECURITY

Keeping your horses healthy

Biosecurity is another way of saying “infectious disease control.” Biosecurity is a combination of management practices designed to prevent the introduction and transmission of diseases into and throughout a herd. Infectious diseases can be transmitted by animals, people, equipment, and vehicles. Equine exhibitions are events where animals have an increased risk of getting infectious diseases due to the commingling of animals from different sources. Taking some simple precautions can help reduce that risk and keep your animals healthy. Below are some biosecurity recommendations for ensuring the health of your exhibition horses.



Before the Show

- Read all guidelines for each show to be sure your animals meet all entry and exhibition requirements.
- Work with your veterinarian to ensure your horses are up to date on vaccinations.
- Evaluate your horse's health prior to going to the show. Never take an unhealthy animal to a show. Signs of illness can include decreased appetite, fever, diarrhea, nasal discharge, enlarged lymph nodes, depressed attitude, incoordination, inability to walk or other neurologic signs. If you see any of these signs, please contact your veterinarian.
- Take only clean and disinfected equipment to the show to prevent any potential disease transfer from your horse to others.

During the Show

- Monitor your horse daily for signs of illness. If you suspect your animal is sick, notify a show official right away.
- Avoid personal contact with animals other than your own.
- Do not share feed, feed/water tubs, grooming supplies, tack or other equipment with other exhibitors at the show.
- Keep your area and equipment clean of manure contamination.
- Wash your hands frequently with warm soapy water after contact with animals or equipment.

After the Show

- Isolate the horses you took to the show from the rest of your herd when you return home.
- The exhibition horses should be as far from other animals as possible, but they need to be at least far enough away to prevent nose-to-nose contact. Your veterinarian can help you establish a good location.
- Modify your chore routine to care for the exhibition horses last each day. Do not share equipment between these horses and other animals at home.
- Monitor the exhibition horses daily for signs of illness, including those signs listed in the “Before the Show” section. Contact your veterinarian if any animal shows signs of illness.
- Clean and disinfect all equipment, shoes, vehicles, and trailers you took to the show. Allow them to dry completely.
- Talk to your veterinarian to determine the best biosecurity practices for your horses.

BIOSECURITY

Keeping your pigs healthy

Biosecurity is another way of saying “infectious disease control.” Biosecurity is a combination of management practices designed to prevent the introduction and transmission of diseases into and throughout a herd. Infectious diseases can be transmitted by animals, people, equipment and vehicles. Livestock exhibitions are events where animals have an increased risk of getting infectious diseases due to the commingling of animals from different sources. Taking some simple precautions can help reduce that risk and keep your animals healthy. Below are some biosecurity recommendations for ensuring the health of your show pigs.



Before the Show

- Read all guidelines for each show to be sure your animals meet all entry and exhibition requirements.
- Work with your veterinarian to ensure your pigs are up to date on vaccinations.
- Evaluate your pigs' health prior to going to the show. Never take an unhealthy animal to a show. Signs of illness can include poor appetite, coughing, “thumping”, labored breathing, fever, depressed attitude, and loose stools. If you see any of these signs, please contact your veterinarian.
- Take only clean and disinfected equipment to the show to prevent any potential disease transfer from your pigs to others.

During the Show

- Monitor your pigs daily for signs of illness. If you suspect your animal is sick, notify a show official right away.
- Avoid personal contact with animals other than your own.
- Do not share feed, feed/water tubs, grooming supplies, or other equipment with other exhibitors at the show.
- Keep your area and equipment clean of manure contamination.
- Wash your hands frequently with warm soapy water after contact with animals or equipment.

After the Show

- Isolate the pigs you took to the show from the rest of your animals when you return home.
- The show pigs should be as far from the other animals as possible, but they need to be at least far enough away to prevent nose-to-nose contact. Your veterinarian can help you establish a good location.
- Modify your chore routine to care for the show pigs last each day. Do not share equipment between show pigs and any other animals at home.
- Monitor the show pigs daily for signs of illness, including those signs listed in the “Before the Show” section. Contact your veterinarian if any animal shows signs of illness.
- Clean and disinfect all equipment, shoes, vehicles and trailers you took to the show. Allow them to dry completely.
- Talk to your veterinarian to determine the best biosecurity practices for your pigs.

BIOSECURITY

Keeping your birds healthy

Biosecurity is another way of saying “infectious disease control.” Biosecurity is a combination of management practices designed to prevent the introduction and transmission of diseases into and throughout a flock. Infectious diseases can be transmitted by animals, people, equipment and vehicles. Poultry exhibitions are events where birds have an increased risk of getting infectious diseases due to the commingling of animals from different sources. Taking some simple precautions can help reduce that risk and keep your animals healthy. Below are some biosecurity recommendations for ensuring the health of your exhibition birds.



Before the Show

- Keep your birds away from migratory waterfowl and other game birds, as these can carry disease-causing germs that could make your birds sick.
- Evaluate your bird's health prior to going to an exhibition. Never bring a bird to a show that is not healthy. Signs of illness can include sudden death; wheezing; coughing; nasal discharge; depressed attitude; decreased feed intake; drop in egg production or quality; swelling/discoloration of eyes, head or neck; tremors; circling; drooping wings; and twisting of the head and neck. If you see any of these signs, please contact your veterinarian.
- Take only clean and disinfected equipment to the exhibition to prevent any potential disease transfer from your birds to others.

During the Show

- Monitor your birds daily for signs of illness. If you suspect your bird is sick, notify a show official right away.
- Avoid personal contact with birds other than your own.
- Do not share feed, feed/water containers, bedding, or other supplies with other exhibitors.
- Clean cages, food, and water containers daily.
- Wash your hands frequently with warm soapy water after contact with birds or equipment.

After the Show

- Isolate the birds you took to the exhibition from the rest of your flock when you return home.
- The exhibition birds should be as far from other birds as possible, but they need to be at least far enough away to prevent direct contact. Your veterinarian can help you establish a good location.
- Modify your chore routine to care for your exhibition birds last each day. Do not share equipment between these birds and any other animals at home.
- Monitor the exhibition birds daily for signs of illness, including those signs listed in the “Before the Show” section. Contact your veterinarian if any bird shows signs of illness.
- Clean and disinfect all equipment, shoes and vehicles you took to the exhibition. Allow them to dry completely.
- Talk to your veterinarian to determine the best biosecurity practices for your birds.

Biosecurity is another way of saying “infectious disease control.” Biosecurity is a combination of management practices designed to prevent the introduction and transmission of diseases into and throughout a herd. Infectious diseases can be transmitted by animals, people, equipment and vehicles. Exhibitions are events where animals have an increased risk of getting infectious diseases due to the commingling of animals from different sources. Taking some simple precautions can help reduce that risk and keep your animals healthy. Below are some biosecurity recommendations for ensuring the health of your show rabbits.



Before the Show

- Read all guidelines for each show to be sure your animals meet all entry and exhibition requirements.
- Evaluate your rabbits' health prior to going to the show. Never take an unhealthy animal to a show. Signs of illness can include depressed attitude, decreased appetite, diarrhea, nasal or eye discharge, difficulty breathing, and twisting of the head and/or neck. If you see any of these signs, please contact your veterinarian.
- Take only clean and disinfected equipment to the show to prevent any potential disease transfer from your rabbits to others.

During the Show

- Monitor your rabbits daily for signs of illness. If you suspect your animal is sick, notify a show official right away.
- Avoid personal contact with animals other than your own.
- Do not share feed, feed/water containers, bedding, or other equipment with other exhibitors at the show.
- Wash your hands frequently with warm soapy water after contact with animals or equipment.

After the Show

- Isolate the rabbits you took to the show from the rest of your animals when you return home.
- The show rabbits should be as far from the other animals as possible, but they need to be at least far enough away to prevent nose-to-nose contact. Your veterinarian can help you establish a good location.
- Modify your chore routine to care for your show rabbits last each day. Do not share equipment between show rabbits and any other animals.
- Monitor your show rabbits daily for signs of illness, including those signs listed in the “Before the Show” section. Contact your veterinarian if any animal shows signs of illness.
- Clean and disinfect all equipment, shoes and vehicles you took to the show. Allow them to dry completely.

BIOSECURITY

Keeping your sheep healthy

Biosecurity is another way of saying “infectious disease control.” Biosecurity is a combination of management practices designed to prevent the introduction and transmission of diseases into and throughout a herd. Infectious diseases can be transmitted by animals, people, equipment and vehicles. Livestock exhibitions are events where animals have an increased risk of getting infectious diseases due to the commingling of animals from different sources. Taking some simple precautions can help reduce that risk and keep your animals healthy. Below are some biosecurity recommendations for ensuring the health of your show sheep.



Before the Show

- Read all guidelines for each show to be sure your animals meet all entry and exhibition requirements.
- Evaluate your sheep’s health prior to going to the show. Never take an unhealthy animal to a show. Signs of illness can include decreased appetite; fever; lameness; abscesses; circular, crusting skin lesions; or blisters on the mouth, teats, and/or hooves. If you see any of these signs, please contact your veterinarian.
- Be particularly vigilant for signs of sore mouth (orf) or club lamb fungus (ringworm) as these can be easily passed to humans.
- Take only clean and disinfected equipment to the show to prevent any potential disease transfer from your sheep to others.

During the Show

- Monitor your sheep daily for signs of illness. If you suspect your animal is sick, notify a show official right away.
- Avoid personal contact with animals other than your own.
- Do not share feed, feed/water tubs, grooming supplies, or other equipment with other exhibitors at the show.
- Keep your area and equipment clean of manure contamination.
- Wash your hands frequently with warm soapy water after contact with animals or equipment.

After the Show

- Isolate the sheep you took to the show from the rest of your flock when you return home.
- The show sheep should be as far from the other animals as possible, but they need to be at least far enough away to prevent nose-to-nose contact. Your veterinarian can help you establish a good location.
- Modify your chore routine to care for the show sheep last each day. Do not share equipment between show sheep and any other animals at home.
- Monitor the show sheep daily for signs of illness, including those signs listed in the “Before the Show” section. Contact your veterinarian if any animal shows signs of illness.
- Clean and disinfect all equipment, shoes, vehicles and trailers you took to the show. Allow them to dry completely.
- Talk to your veterinarian to determine the best biosecurity practices for your sheep.

Appendix 2 – Kansas 4-H Biosecurity Survey

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

Welcome to the Kansas Department of Agriculture Division of Animal Health Youth Exhibitor Survey! You have been selected to complete this survey because you are enrolled in a 4-H animal project in Kansas. Please only complete one survey per family.

In light of recent animal disease outbreaks across the country, there has been an increased emphasis on the importance of biosecurity in the animal health industry. Biosecurity is another way of saying "infectious disease control." Biosecurity is especially important at livestock and equine exhibition events where animals from multiple places mix in one location and then disperse again to various destinations. To support the biosecurity efforts at large exhibition events like the Kansas State Fair, we are conducting a survey of youth exhibitors to gain an understanding of the current biosecurity practices you use with your own animals. We will use the information you give us to help identify ways we can improve our biosecurity efforts as an industry and plan to develop education and outreach materials to help you improve your biosecurity practices at exhibition events. By doing your part to protect the health of your own animals, you can contribute to protecting the health of the livestock and equine industries state-wide.

This survey is voluntary. Your responses are completely anonymous.

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

Did you show your 4-H animal(s) at an exhibition event during 2016?

- ☐ Yes
☐ No

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

Which shows did you exhibit your 4-H animal(s) at during 2016? Please select all that apply.

- ☐ County fair
☐ Kansas State Fair
☐ Kansas Junior Livestock Show
☐ Did not show at any of these exhibitions

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

What types of animals did you show at your county fair in 2016? Please select all that apply.

- ☐ Beef cattle
☐ Dairy cattle
☐ Meat goats
☐ Dairy goats
☐ Poultry (chickens, turkeys, ducks, pigeons)
☐ Sheep

- ☐ Swine
- ☐ Horses

What types of animals did you show at the Kansas State Fair in 2016? Please select all that apply.

- ☐ Beef cattle
- ☐ Dairy cattle
- ☐ Meat goats
- ☐ Dairy goats
- ☐ Poultry (chickens, turkeys, ducks, pigeons)
- ☐ Sheep
- ☐ Swine
- ☐ Horses

What types of animals did you show at the Kansas Junior Livestock Show in 2016? Please select all that apply.

- ☐ Beef cattle
- ☐ Meat goats
- ☐ Sheep
- ☐ Swine

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

Which type of beef cattle did you show at your county fair?

- ☐ Market
- ☐ Breeding
- ☐ Both

Which type of meat goats did you show at your county fair?

- ☐ Market
- ☐ Breeding
- ☐ Both

Which type of poultry did you show at your county fair?

- ☐ Market
- ☐ Breeding
- ☐ Both

Which type of sheep did you show at your county fair?

- ☐ Market
- ☐ Breeding
- ☐ Both

Which type of swine did you show at your county fair?

- ☐ Market
- ☐ Breeding
- ☐ Both

Which type of beef cattle did you show at the Kansas State Fair?

- ☐ Market
- ☐ Breeding

☐ Both

Which type of meat goats did you show at the Kansas State Fair?

- ☐ Market
☐ Breeding
☐ Both

Which type of poultry did you show at the Kansas State Fair?

- ☐ Market
☐ Breeding
☐ Both

Which type of sheep did you show at the Kansas State Fair?

- ☐ Market
☐ Breeding
☐ Both

Which type of swine did you show at the Kansas State Fair?

- ☐ Market
☐ Breeding
☐ Both

Which type of beef cattle did you show at the Kansas Junior Livestock Show?

- ☐ Market
☐ Breeding
☐ Both

Which type of meat goats did you show at the Kansas Junior Livestock Show?

- ☐ Market
☐ Breeding
☐ Both

Which type of sheep did you show at the Kansas Junior Livestock Show?

- ☐ Market
☐ Breeding
☐ Both

Which type of swine did you show at the Kansas Junior Livestock?

- ☐ Market
☐ Breeding
☐ Both

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

At the end of your county fair, where did your horse(s) go directly after leaving the fairgrounds?

- ☐ Home
☐ Another show
☐ Other (please specify)

At the end of your county fair, where did your beef cattle go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of your county fair, where did your dairy cattle go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of your county fair, where did your meat goat(s) go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of your county fair, where did your dairy goat(s) go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of your county fair, where did your poultry go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of your county fair, where did your sheep go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of your county fair, where did your swine go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

At the end of the Kansas State Fair, where did your horse(s) go directly after leaving the fairgrounds?

- ☐ Home
- ☐ Another show
- ☐ Other (please specify)

At the end of the Kansas State Fair, where did your beef cattle go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of the Kansas State Fair, where did your dairy cattle go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of the Kansas State Fair, where did your meat goat(s) go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of the Kansas State Fair, where did your dairy goat(s) go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of the Kansas State Fair, where did your poultry go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of the Kansas State Fair, where did your sheep go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of the Kansas State Fair, where did your swine go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

At the end of the Kansas Junior Livestock Show, where did your beef cattle go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of the Kansas Junior Livestock Show, where did your meat goat(s) go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of the Kansas Junior Livestock Show, where did your sheep go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

At the end of the Kansas Junior Livestock Show, where did your swine go?

- ☐ Home
- ☐ Another show
- ☐ Sold at auction
- ☐ Other (please specify)

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

The following definitions may be helpful for answering the questions on this page.

Biosecurity measures: Biosecurity measures are things you do to prevent your animals from getting an infectious disease. These include things that keep disease out of your herd, as well as things that keep disease from spreading between animals within your herd. Disease can be spread through direct animal-to-animal contact; indirect contact with urine, feces, nasal discharge, saliva, etc.; or through objects, such as feed tubs, halters, bedding, panels, cages,

etc. Some diseases are also spread between animals by mosquitoes, ticks, and flies.

Disinfect: To disinfect an object is to use a disinfectant, such as bleach, on an object's surfaces to kill disease-causing bacteria, viruses, or fungi that may be present.

Symptoms of disease: Symptoms of disease in livestock and horses can include decreased appetite, fever, diarrhea, depressed attitude, nasal discharge, excessive salivation, and blisters around the mouth, nose or hooves. Symptoms of disease in poultry can include decreased appetite, drooping wings, nasal discharge, depressed attitude, and swelling around the eyes, head, or neck.

Before taking your animal(s) to an exhibition event, how often do you do the following?

Check your animal(s) for symptoms of disease

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

Disinfect your equipment

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

Disinfect the outside of your truck

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

Disinfect your livestock trailer

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

Disinfect your footwear (boots, shoes, etc.)

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

Before taking your animals to an exhibition event, do you take any other biosecurity measures not listed above?

- ☐ Yes
- ☐ No

If yes, please describe what you do.

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

The following definitions may be helpful for answering the questions on this page.

Biosecurity measures: Biosecurity measures are things you do to prevent your animals from getting an infectious disease. These include things that keep disease out of your herd, as well as things that keep disease from spreading between animals within your herd. Disease can be spread through direct animal-to-animal contact; indirect contact with urine, feces, nasal discharge, saliva, etc.; or through an objects, such as feed tubs, halters, bedding, panels, cages, etc. Some diseases are also spread between animals by mosquitoes, ticks, and flies.

Disinfect: To disinfect an object is to use a disinfectant, such as bleach, on an object's surfaces to kill whatever bacteria, viruses, or fungi that may be present.

While at an exhibition event with your animal(s), how often do you do the following?

Disinfect the pen/stall prior to housing your animal(s)

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

Attempt to prevent physical contact between your animal(s) and other exhibitors' animals

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

Touch or handle other exhibitors' animals

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

Allow visitors to touch your animal(s)

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

While at an exhibition event with your animal(s), do you ever share any equipment with other

exhibitors?

- ☐ Yes
- ☐ No

How often do you disinfect shared equipment before using it with your animal(s)?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

While at an exhibition event with your animal(s), do you take any other biosecurity measures not listed above?

- ☐ Yes
- ☐ No

If yes, please describe what you do.

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

The following definitions may be helpful for answering the questions on this page.

Biosecurity measures: Biosecurity measures are things you do to prevent your animals from getting an infectious disease. These include things that keep disease out of your herd, as well as things that keep disease from spreading between animals within your herd. Disease can be spread through direct animal-to-animal contact; indirect contact with urine, feces, nasal discharge, saliva, etc.; or through objects, such as feed tubs, halters, bedding, panels, cages, etc. Some diseases are also spread between animals by mosquitoes, ticks, and flies.

Disinfect: To disinfect an object is to use a disinfectant, such as bleach, on an object's surfaces to kill whatever bacteria, viruses, or fungi that may be present.

Quarantine: To quarantine an animal is to physically separate it from other animals for a period of time to prevent the potential spread of disease from the quarantined animal to other animals. At minimum a quarantine should prevent nose-to-nose contact between animals.

After having been at an exhibition event with your animal(s), how often do you do the following?

Wash the clothes you wore at the exhibition event

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

Disinfect your equipment

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

Disinfect the outside of your truck

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

Disinfect your livestock trailer

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

Disinfect your footwear (boots, shoes, etc.)

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Most of the time
- ☐ Always

Upon returning home at the end of an exhibition event, do you quarantine your show animal(s) from other animals on the property?

- ☐ Yes
- ☐ No, my show animals are not quarantined from other animals on my property
- ☐ No, there are no other animals on my property

For how long do you quarantine your show animals from other animals after returning home from an exhibition?

- ☐ 1 - 7 days
- ☐ 8 - 14 days
- ☐ 15 - 21 days
- ☐ Greater than 21 days

After having been at an exhibition event with your animal(s), do you take any other biosecurity measures not listed above?

- ☐ Yes
- ☐ No

If yes, please describe what you do.

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

Have you ever vaccinated your horse(s) against equine herpesvirus-1? This is commonly known as the "rhino vaccine."

- ☐ Yes
- ☐ No
- ☐ Don't know

How often do you vaccinate your horse(s) for equine herpesvirus-1? This is commonly known as the "rhino vaccine"?

- ☐ Every 6 months
- ☐ Every 7 to 12 months
- ☐ Greater than every 12 months
- ☐ Don't know

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

Do you work with a veterinarian to protect the health of your 4-H animal(s)?

- ☐ Yes
- ☐ No, but I know a veterinarian I could call if needed
- ☐ No, I do not know a veterinarian that I could use for my 4-H animal(s)
- ☐ Don't know

Kansas Department of Agriculture Division of Animal Health

Youth Exhibitor Survey

Do you have other livestock or horses at home in addition to your 4-H animal(s)?

- ☐ Yes, I have livestock (cattle, goats, sheep, swine, and/or poultry)
- ☐ Yes, I have horses
- ☐ Yes, I have both livestock and horses
- ☐ No

Appendix 4 – KSF Study Volunteer Description



Kansas State Fair Observational Study – Volunteer Position
September 9 – 17, 2016
Kansas State Fairgrounds
Hutchinson, Kansas

The Kansas Department of Agriculture Division of Animal Health is looking for observant volunteers with a positive attitude to help conduct an observational study at the 2016 Kansas State Fair. The study will run from Friday, September 9 through Saturday, September 17, and it is focused on public health and zoonotic disease risk at the fair. Volunteers will be asked to observe and record visitor behavior in the livestock barns for seven hours during the day. Volunteers will be observing only and will have no interaction with the visitors. We are asking volunteers to commit to one full day at minimum, but we welcome anyone that would be willing to work multiple days as well. The day will be split into two 3.5-hour shifts – one in the morning and one in the afternoon with a lunch break in between. The rest of the day would be yours to enjoy the fair. Your time would be compensated with \$50 and free admission to the fair.

Appendix 5 – KSF Facility Assessment Forms

Observational Study – Facility Assessment
Kansas State Fair
September 9 – 18, 2016
EXHIBITION BARNS

DATE: _____ TIME: _____
LOCATION: _____
OBSERVER: _____
SPECIES HOUSED: _____

How many hand hygiene stations are there? Which type (sink vs sanitizer)? Where are they located?
How tall are they? Are they appropriately stocked? Visible? Easily accessible? Are the hand hygiene stations easily accessible to children and people with disabilities?

Do the hand hygiene stations have signage? Contents? Language? Size?

Other signs in the barn about zoonotic risk or risky behaviors? Contents? Language? Size? Location?

Any information about swine influenza?

How many entrances/exits to the barn? Where are they located? Type of door? Is there any organization to the flow of visitors through the barn?

Are there trash cans near the entrance to dispose of food/drink items?

Are there places where visitors can touch the animals or animal stalls? Locations?

Is food served in the facility? Are any of the hand hygiene stations near the food vendor?

Other observations?

Observational Study – Facility Assessment
Kansas State Fair
September 9 – 18, 2016
PETTING ZOO

DATE: _____ TIME: _____
LOCATION: PETTING ZOO
OBSERVER: _____
SPECIES HOUSED (include approximate age):

How many hand hygiene stations are there? Which type (sink vs sanitizer)? Where are they located?
How tall are they? Are they adequately stocked? Visible? Are the hand hygiene stations easily accessible to children and people with disabilities?

Do the hand hygiene stations have signage? Contents? Language? Size?

Other signs in the exhibit about zoonotic risk or risky behaviors? Contents? Language? Size? Location?

How many entrances/exits to the exhibit? What type?

Organization of flow of visitors through the exhibit?

Are there trash cans near the entrance to dispose of food/drink items?

Are visitors separated from the animals or are they allowed in the enclosures? Is it different for different species?

Is feed available for visitors to feed the animals? What kind of container does it come in? Cost?

Other observations?

Appendix 6 – KSF Observational Study Forms



Kansas State Fair Observational Study – Risky Visitor Behavior

September 9 – 17, 2016

Diane Larson cell #: (913) 206-9707

DATE: _____ TIME IN: _____ TIME OUT: _____

LOCATION: _____

OBSERVER: _____

SPECIES PRESENT TODAY:

Observe the following for 30 minutes:

How many do you see?	Tally.
Strollers	
Walkers/Canes	
Wheelchairs	
Service animals (dogs)	

How many adults and children do you see exhibiting the following behaviors? Tally as you observe. If you see any risky behaviors* not listed below, please add them to the table. Use the back of the form if necessary.

Behavior	Adults	Children**
Eating and/or drinking in the barn (includes sippy cups and bottles)		
Using pacifiers or teething toys in the barn		
Touching the animals		
Animals licking person's skin or clothing		
Touching the animal enclosures* with their hands		
Touching the animal enclosures* with their face/mouth		
Touching hands to face/mouth (rubbing eyes, biting nails, sucking thumb, etc.)		
Falling down or sitting on the ground		
Stepping in manure		

Instructions: For this study, you will be observing human behavior in one of the animal exhibits (livestock and equine barns) for 30 minutes and recording your observations on the front of this sheet. Volunteers will be strategically placed around the barn to capture the most information. If not already filled in, please record the date, time in, time out, location, and your name at the top of the sheet. Also record the species of animals present in the barn that day. During this 30 minute period, please keep a tally of the number of strollers, walkers/canes, wheelchairs, and service animals (dogs) you see. You will also need to keep a tally of the number of adults and children that perform the behaviors listed in the table. You only need to record a behavior once per person (i.e., if the same child touches three different animals that still only counts as one tally). If you notice anyone performing a risky behavior* that is not listed in the table, please add the behavior to the table and keep a tally of that behavior. At the end of the 30 minute period, please meet back up with the group at the designated meeting spot so we can move on to the next barn. At the bottom of the back page is some blank space where you can leave additional comments about what you observed in the barns (relating to public health or zoonotic disease risk) or any constructive comments about improving the study. My cell phone number is listed at the top of the front page in case you need it for any reason throughout the day.

*A risky behavior is any behavior that puts a person at increased risk of becoming infected by a zoonotic disease from an animal. Zoonotic diseases are diseases that can be passed between animals and humans. These pathogens can be spread by any bodily fluid or secretion from an animal including, but not limited to, nasal discharge, saliva, ocular discharge, blood, semen, milk, urine, and feces. Humans usually acquire these diseases through the oral or nasal route. Any time a person's skin, clothing, or shoes come in contact with an animal, an animal's bodily secretions, or a potentially contaminated surface/material they are at risk of infecting themselves with a zoonotic disease. Behaviors that create these types of contact can cause zoonotic disease transmission.

**Children are defined as anyone looking to be 12 years of age or younger. We realize this is not a very specific definition of children, but it should suffice for the information we are seeking. There will be some expected misclassification due to the broad definition of the category as well as natural inter-observer variance.

*Animal enclosures include gates, panels, chains, bars, stall doors and walls, floors of pens/stalls/tie-out areas, cages, etc. as well as bedding, feed tubs, and waterers.

Comments:



Kansas State Fair Observational Study – Risky Visitor Behavior
 September 9 – 17, 2016
 Diane Larson cell #: (913) 206-9707

DATE: _____ TIME IN: _____ TIME OUT: _____

LOCATION: PETTING ZOO

OBSERVER: _____

SPECIES PRESENT TODAY:

Observe the following for 30 minutes:

How many do you see?	Tally.
Strollers	
Walkers/Canes	
Wheelchairs	
Service animals (dogs)	

How many adults and children do you see exhibiting the following behaviors? Tally as you observe. If you see any risky behaviors* not listed below, please add them to the table on the back of the form.

Behavior	Adults	Children**
Eating and/or drinking in the exhibit (includes sippy cups and bottles)		
Using pacifiers or teething toys in the exhibit		
Touching the animals		
Feeding the animals		
Eating the animal feed		
Animals licking person's skin or clothing		
Touching the animal enclosures* with their hands		
Touching the animal enclosures* with their face/mouth		
Touching hands to face/mouth (rubbing eyes, biting nails, sucking thumb, etc.)		
Falling down or sitting on the ground		
Touching or picking up animal feces		

Behavior	Adults	Children**

Instructions: For this study, you will be observing human behavior in the petting zoo for 30 minutes and recording your observations on the front of this sheet. Volunteers will be strategically placed around the petting zoo to capture the most information. If not already filled in, please record the date, time in, time out, location, and your name at the top of the sheet. Also record the species of animals present at the petting zoo that day. During this 30 minute period, please keep a tally of the number of strollers, walkers/canes, wheelchairs, and service animals (dogs) you see. You will also need to keep a tally of the number of adults and children that perform the behaviors listed in the table. You only need to record a behavior once per person (i.e., if the same child touches three different animals that still only counts as one tally). If you notice anyone performing a risky behavior* that is not listed in the table, please add the behavior to the table and keep a tally going. At the end of the 30 minute period, please meet back up with the group at the designated meeting spot so we can move on to the next barn. At the bottom of the back page is some blank space where you can leave additional comments about what you observed in the barns (relating to public health or zoonotic disease risk) or any constructive comments about improving the study. My cell phone number is listed at the top of the front page in case you need it for any reason throughout the day.

*A risky behavior is any behavior that puts a person at increased risk of becoming infected by a zoonotic disease from an animal. Zoonotic diseases are diseases that can be passed between animals and humans. These pathogens can be spread by any bodily fluid or secretion from an animal including, but not limited to, nasal discharge, saliva, ocular discharge, blood, semen, milk, urine, and feces. Humans usually acquire these diseases through the oral or nasal route. Any time a person's skin, clothing, or shoes come in contact with an animal, an animal's bodily secretions, or a potentially contaminated surface/material they are at risk of infecting themselves with a zoonotic disease. Behaviors that create these types of contact can cause zoonotic disease transmission.

**Children are defined as anyone looking to be 12 years of age or younger. We realize this is not a very specific definition of children, but it should suffice for the information we are seeking. There will be some expected misclassification due to the broad definition of the category as well as natural inter-observer variance.

*Animal enclosures include gates, panels, chains, bars, stall doors and walls, floors of pens/stalls/tie-out areas, cages, etc. as well as bedding, feed tubs, and waterers.

Comments:



Kansas State Fair Observational Study – Hand Hygiene
 September 9 – 17, 2016
 Diane Larson cell #: (913) 206-9707

DATE: _____ TIME IN: _____ TIME OUT: _____

LOCATION: _____

OBSERVER: _____

Are the hand hygiene stations adequately stocked?

Hand Sanitizer: Circle current state and indicate how many:

Empty _____ ¼ Full _____ ½ Full _____ ¾ Full _____ Full _____

Sinks: Is the water working? YES NO
 Is a soap dispenser present? YES NO
 Is there soap in the dispenser? YES NO N/A
 If yes, how full? Circle and indicate how many.
 Empty _____ ¼ Full _____ ½ Full _____ ¾ Full _____ Full _____ Cannot determine _____
 Is there a paper towel dispenser present? YES NO
 Are there paper towels in the dispenser? YES NO N/A

Were any of the hand hygiene stations maintained while you were observing? YES NO
 If yes, please explain what maintenance occurred.

Observe the following for 30 minutes:

Are there any staff/volunteers present to encourage hand hygiene? YES NO
 If yes, how many? How long were they there?

Do the hand hygiene stations seem easily accessible to children and people with disabilities? Please describe.

Did anyone attempt to clean their hands, but couldn't due to inadequate hand hygiene supplies? YES NO
 How many? Please describe.

How many people that walked by* the hand hygiene station cleaned their hands? Tally as you observe.

	Adults	Children**
YES, cleaned their hands		
NO, did not clean their hands		

Instructions: For this study, you will be observing hand hygiene behavior in one of the animal exhibits for 30 minutes and recording your observations on the front of this sheet. Volunteers will be strategically placed around the hand hygiene stations in the barn to capture the most information. If not already filled in, please record the date, time in, time out, location, and your name at the top of the sheet. Take a moment before you start observing to answer the questions about the current state of the hand hygiene stations. Many of the barns do not have sinks, so just write “no sink” beside that question in those barns. During this 30 minute period, please keep a tally of the number of adults and children that use hand sanitizer or wash their hands. Tally “yes” or “no” for everyone you see walk by* the hand hygiene station. Also record any maintenance that occurred and any presence of staff encouraging hand hygiene. At the end of the 30 minute period, please meet back up with the group at the designated meeting spot so we can move on to the next barn. At the bottom of the back page is some blank space where you can leave additional comments about what you observed in the barns (relating to hand hygiene practices, public health, or zoonotic disease risk) or any constructive comments about improving the study. My cell phone number is listed at the top of the front page in case you need it for any reason throughout the day.

*Walked by should be defined as passing within approximately 5 feet of the hand washing station.

**Children should be defined as anyone looking to be 12 years old or younger. We realize this is not a very specific definition of children, but it should suffice for the information we are seeking. There will be some expected misclassification due to the broad definition of the category as well as natural inter-observer variance.

Comments:

Appendix 7 – Educational Signs in Animal Exhibits at the KSF

Sign present on hand sanitizing stations at the Fair.



Zoonotic disease risk sign posted outside the entrance to the Petting Zoo.



**After you touch ducklings or chicks,
wash your hands so you don't get sick!**



- Contact with live poultry (chicks, chickens, ducklings, ducks, geese, and turkeys) can be a source of human *Salmonella* infections.
- *Salmonella* germs can cause a diarrheal illness in people that can be mild, severe, or even life threatening.
- Chicks, ducklings, and other live poultry can carry *Salmonella* germs and still appear healthy and clean.
- *Salmonella* germs are shed in their droppings and can easily contaminate their bodies and anything in areas where birds live and roam.

Protect Yourself and Your Family from Germs

DO:

- Wash your hands thoroughly with soap and water right after touching live poultry or anything in the area where they live and roam.
- Adults should supervise hand washing for young children.
- If soap and water are not readily available, use hand sanitizer until you are able to wash your hands thoroughly with soap and water.
- Clean any equipment or materials associated with raising or caring for live poultry outside the house, such as cages or feed or water containers.

DON'T:

- Don't let children younger than 5 years of age, elderly persons, or people with weak immune systems handle or touch chicks, ducklings, or other live poultry.
- Don't let live poultry inside the house, in bathrooms, or especially in areas where food or drink is prepared, served, or stored, such as kitchens, or outdoor patios.
- Don't snuggle or kiss the birds, touch your mouth, or eat or drink around live poultry.

For more information, call 1-800-CDC-INFO or visit www.cdc.gov.





Hand hygiene sign present in most of the animal exhibits.



Hand hygiene sign present in most of the animal exhibits.

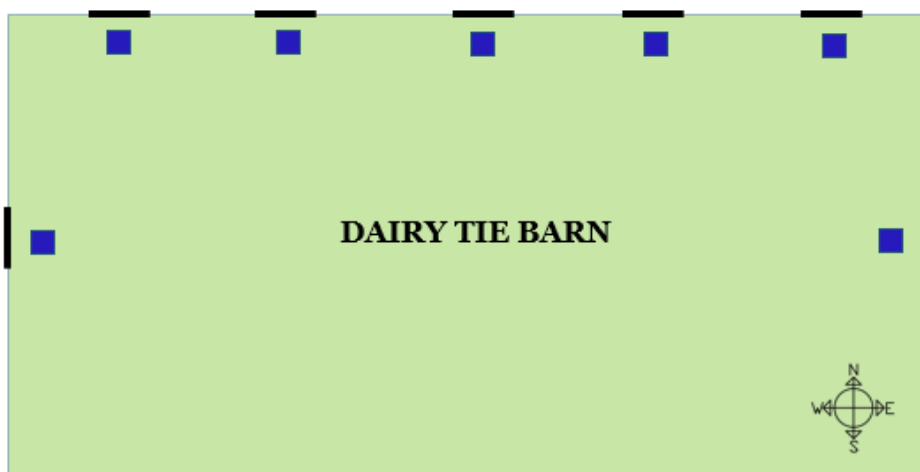


Appendix 8 –Hand Sanitizing Station Recommendations at the KSF

Proposed hand sanitizing station locations inside the Birthing Center.



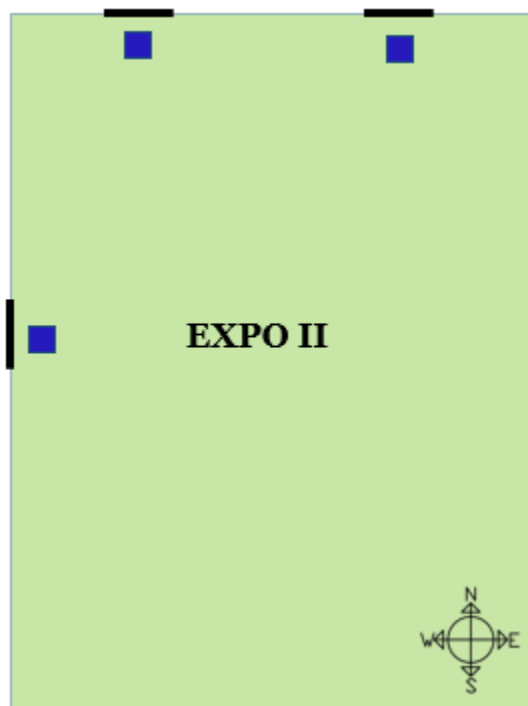
Proposed hand sanitizing station locations inside the Dairy Tie Barn.



Proposed hand sanitizing station locations inside the Expo Center.



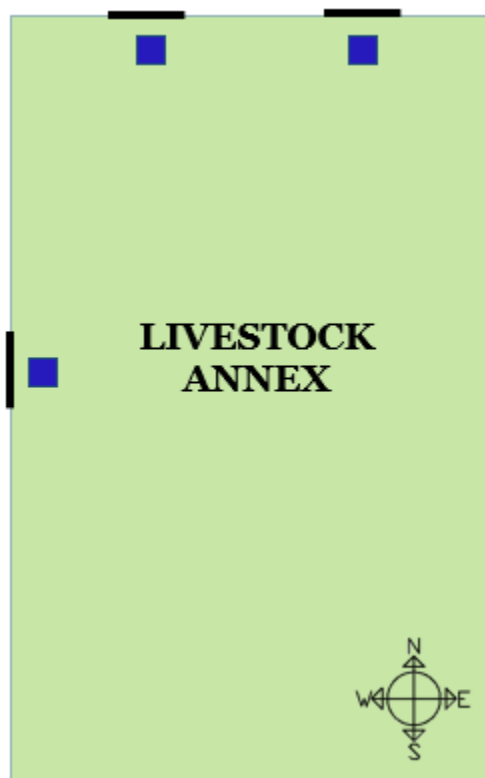
Proposed hand sanitizing station locations inside Expo II.



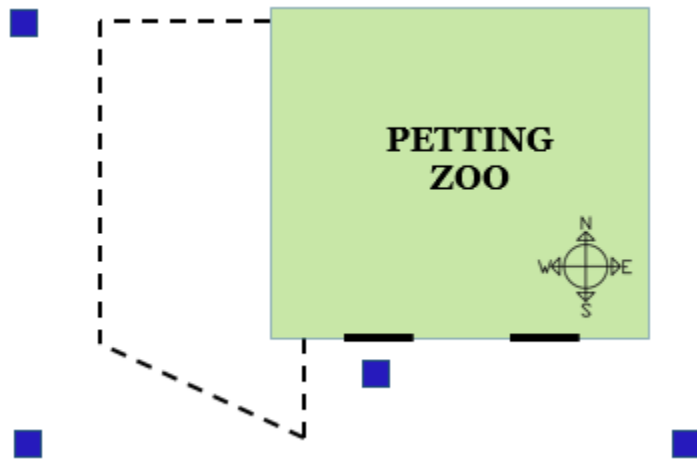
Proposed hand sanitizing station locations inside the Horse Barn.



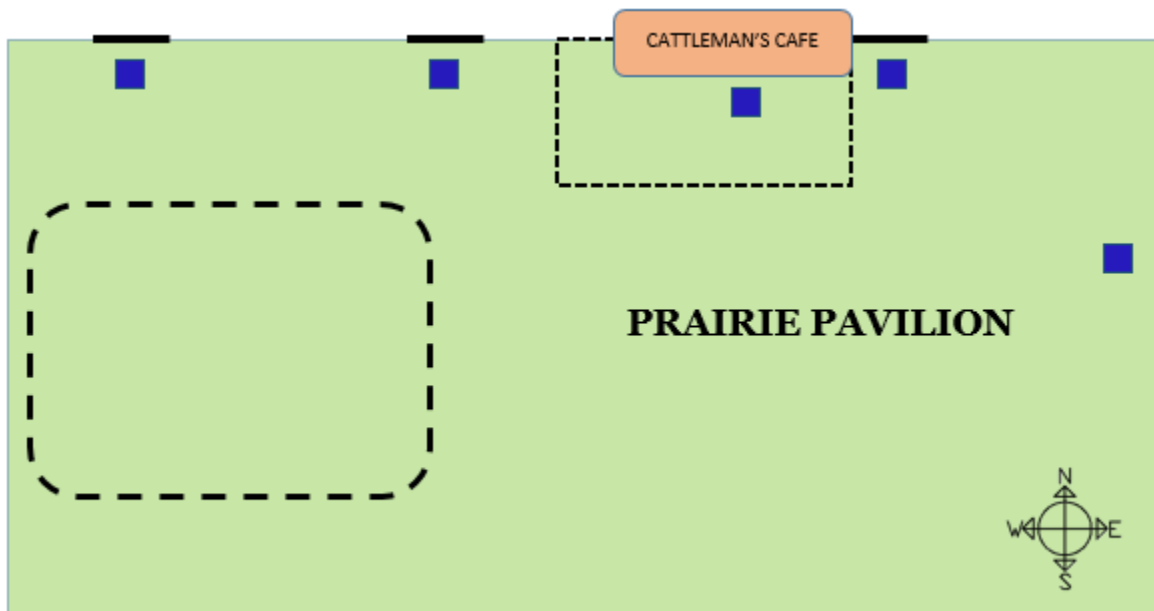
Proposed hand sanitizing station locations inside the Livestock Annex.



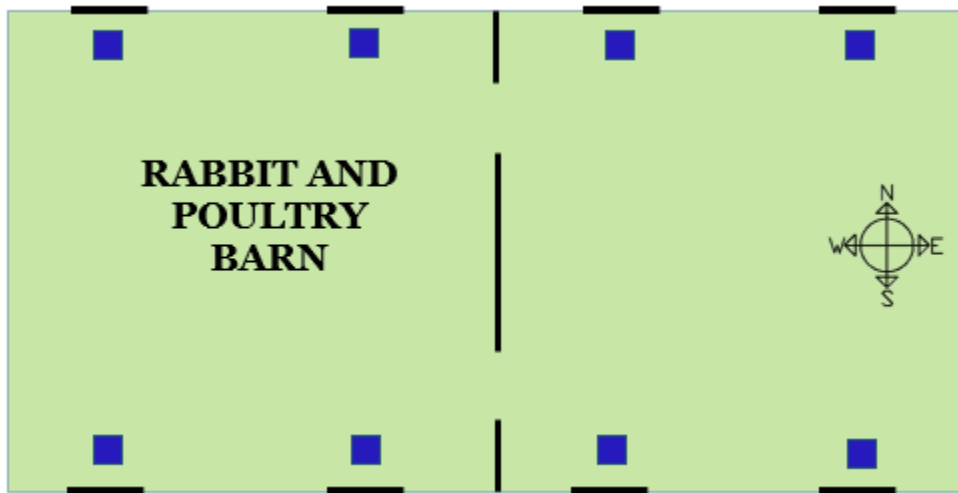
Proposed hand sanitizing station locations around the Petting Zoo.



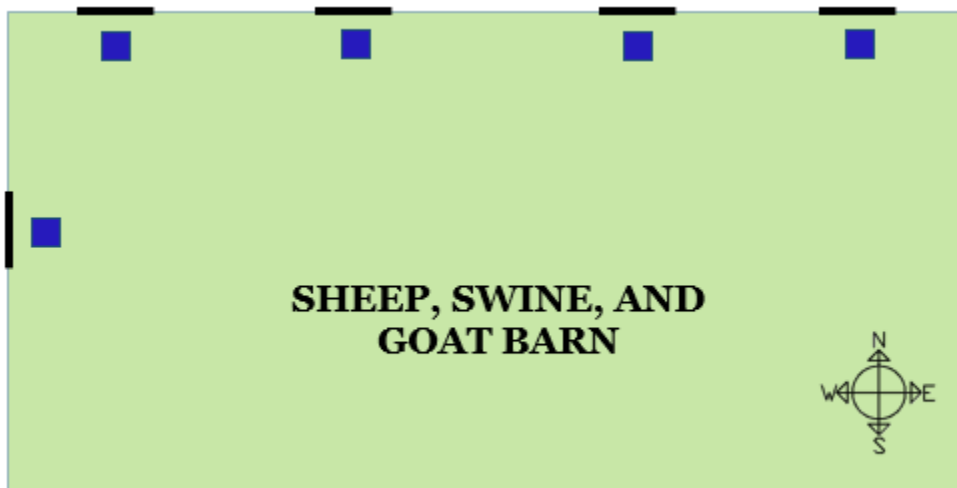
Proposed hand sanitizing station locations inside the Prairie Pavilion.



Proposed hand sanitizing station locations inside the Rabbit and Poultry Barn.



Proposed hand sanitizing station locations inside the Sheep, Swine, and Goat Barn.



Appendix 9 – Kansas State Fairgrounds Map

GUIDE TO THE KANSAS STATE FAIRGROUNDS

